TRANSDISCIPLINARITY

"STIMULATING SYNERGIES,
INTEGRATING KNOWLEDGE"

UNESCO

Division of Philosophy and Ethics

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Transdisciplinarity: Stimulating Synergies, Integrating Knowledge

How to tackle the manifold aspects of reality? How to increase understanding on global and complex issues? How to stimulate synergies among disciplines? How to support co-operation and exchange among experts and sectors?

These questions provided the broad scope of the Symposium on Transdisciplinarity which took place in Royaumont Abbey in May 1998. The present report tries to account for the many discussions among scholars and to outline the theoretical debate and the practical advice and recommendations. This report wishes to provide tools to increase conceptual knowledge and operative know-how on transdisciplinary issues, and it hopes to give new insights to the many programmes of UNESCO.

As a multi-sectoral organization, UNESCO has often been involved in activities beyond the mono-disciplinary perspective. Year after year, the co-operation among various sectors and disciplines has assumed different modalities. These modalities have been differently labelled: “multi-disciplinarity”, “inter-disciplinarity”, and now “trans-disciplinarity”.

Borders, similarities and differences among these perspectives have rarely been clearly explained. This report then tries to clarify the not always evident distinction and articulation between ‘multi-’, ‘inter-’ and ‘trans-disciplinary’ approaches to theoretical knowledge and problem solving.

The lack of clarification has caused a widespread impression that co-operation among disciplines and sectors can be achieved through unstructured brainstorming. To address complex issues that fall outside the domain of a single discipline or the competence of an individual, it seemed enough to call meetings, to put people together, and to collect their contributions.

On the contrary, the Symposium made it clear that this is not enough. Gathering is a requirement. Proximity is a necessity. Even establishing a daily physical or virtual exchange is crucial. But a substantial factor, the most important factor, is the kind of interaction among the elements of the gathering. And, as is the case for human beings, the decisive ‘ingredient’ is their mental and personal disposition to trust, share, negotiate and collaborate.

In an academic world characterized by a plethora of segmented disciplines, “integration” is the cardinal keyword to increase understanding. Neither multi-disciplinarity nor inter-disciplinarity meets this criterion.

Multi-disciplinarity, often relying on the simple juxtaposition of mono-disciplinary approaches, frequently fails to produce unified outlooks. Inter-disciplinarity, mostly based on assembling distinct viewpoints, keeps its roots in fragmented disciplines, and consequently misses the coherence it is aiming at.
Addressing global and complex issues requires a qualitative, not just quantitative, shift. This shift — characterised as “integration of knowledge” — is a direct outcome of the redefinition of the object of study. Such redefinition has to be carried out within the framework of the fundamental unity underlying all forms of knowledge. This framework constitutes the theoretical background of a “transdisciplinary dimension”.

Transdisciplinarity is the “intellectual space” where the nature of the manifold links among isolated issues can be explored and unveiled, the space where issues are rethought, alternatives reconsidered, and interrelations revealed.

In this dimension, the notion of “transectorality” needs also to be re-examined — as many scholars urged — in the light of the many reflections started on transdisciplinarity. Indeed, a transectoral approach, as transdisciplinary approach, aims at soundly composed views. This requires an exploration of new meanings of “synergy”.

The “co-operative work” — the ‘syn-ergon’ — among people or sectors has to go beyond its mere quantitative dimension, and the often dissonant ‘poly-phony’ of many distinct voices has to be reconceived to reach a higher level of harmony. It has to be “transformed” into a ‘sym-phony’.

Transdisciplinarity has been happily synthesised as “the meeting point of people and minds”. This is the ‘intellectual space’ where the concrete daily work of UNESCO has to be rethought in a dimension of ‘synergy’ and ‘integration’ of efforts. The Symposium provided some clues in this regard.

In striving for this synergy, one should not rely upon ready-made procedures, stereotyped formulas, and standardized answers. One should not be afraid of leaving behind familiar ground, nor be fearful to admit ignorance in front of the unknown. One should learn to be comfortable with uncertainty, and be ready to trust. In other words, be ready to get transformed, in order to see things getting transformed.

This endeavour is not easy. Trying to achieve effective transectorality, as trying to undertake transdisciplinary approaches, is a truly difficult task. But it is important to have realized that this effort implies new eyes, new dispositions, new behaviours and new ways of thinking since, as Albert Einstein used to remember, “the significant problems we face cannot be solved by the same level of thinking that created them”.

Indeed this is the way to go if we want to face — and solve — the complex global issues of the next millennium.

Yersu Kim
Director
Division of Philosophy and Ethics
# Table of Contents

Transdisciplinarity: Stimulating Synergies, Integrating Knowledge

Introduction ........................................................................................................... vii

1.1 - UNESCO, a Transdisciplinary Organization ............................................. 3
1.2 - UNESCO Transdisciplinary Programmes, a brief overview ....................... 3
1.3 - UNESCO Transdisciplinary Programmes, preliminary insights .................. 4

2.1 - A Metaphor for Transdisciplinarity ............................................................ 9
2.2 - A Symposium on Transdisciplinarity .......................................................... 10

3.1 - Transdisciplinarity, integrative processes and integrated knowledge ........... 13
3.2 - Transdisciplinarity, building a theoretical framework .................................. 13
3.3 - Transdisciplinarity, drawing a conceptual background ............................... 14
3.4 - Transdisciplinarity, an insightful approach for every issue? ....................... 16
3.5 - Transdisciplinarity, against the disciplines? ............................................. 17
3.6 - Transdisciplinarity, beyond Multidisciplinarity and Interdisciplinarity .......... 18

What is Transdisciplinarity?
   4.1.1 — Plenary #1 ......................................................................................... 21
   4.1.2 — Working Group #1 ........................................................................... 24

What makes Transdisciplinarity succeed or fail?
   4.2.1 — Plenary #2 ....................................................................................... 26
   4.2.2 — Working Group #2 ........................................................................... 29

What global issues need Transdisciplinarity?
   4.3.1 — Plenary #3 ....................................................................................... 30
   4.3.2 — Working Group #3 ........................................................................... 31

How do we research and evaluate Transdisciplinarity?
   4.4.1 — Plenary #4 ....................................................................................... 32
   4.4.2 — Working Group #4 ........................................................................... 34

Conclusion: Transdisciplinarity as Self-transformation ....................................... 37

Reference Materials
Bibliography on Transdisciplinarity
List of Participants

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Introduction

By virtue of its own multi-sectoral nature, and faithful to its mandate, UNESCO has a long-standing engagement with initiatives and ideas stemming from the co-operation of various disciplines, on a ground fertilized by the encounter of all the world’s cultures.

This is precisely why the *International Symposium on Transdisciplinarity* — held in Val-d’Oise from 25 to 29 May 1998, in the marvelous Cistercian setting of the Royaumont Abbey — on the theme “Towards Integrative Process and Integrated Knowledge” has aroused the deepest interest and support of the Organization.

The Symposium, organized by the *McGill Centre for Ethics, Medicine and Law* (Montreal, Canada), was sponsored by the *Encyclopaedia of Life Support Systems* and UNESCO, actively represented by the Division of Philosophy and Ethics.

Twenty-seven participants, including scholars coming from universities in seven countries, together with representatives from different sectors of UNESCO (Education, Social Sciences, Natural Sciences and Philosophy), took the opportunity to undertake a thorough dialogue on transdisciplinarity.

After the welcoming addresses by the two co-convenors (Prof. Margaret Somerville and Prof. David Rapport), the Director of the Division of Philosophy and Ethics of UNESCO (Prof. Yersu Kim), and the *E.O.L.S.S.* representative (Prof. Andrew Sage), four fundamental questions were put up for reflection:

a) What is transdisciplinarity?
b) What makes transdisciplinarity succeed or fail?
c) What global issues need transdisciplinarity?
d) How do we research and evaluate transdisciplinarity?
1.1 — UNESCO, a Transdisciplinary Organization

1.2 — UNESCO Transdisciplinary Programmes, a brief overview

1.3 — UNESCO Transdisciplinary Programmes, preliminary insights
1.1 — UNESCO, a Transdisciplinary Organization

As the UNESCO Director-General, Mr. Federico Mayor, said at the opening of the International Symposium on Interdisciplinarity, back in 1991, when McGill University and UNESCO had previously sat around the same table to enucleate problems and hopes of interdisciplinarity and transdisciplinarity,

«the contributions made by our Organization to the family of the United Nations are founded on different points of view; they bring together scientific components — in the strictest sense of the word — and cultural and ethical knowledge».

Indeed UNESCO has always placed the utmost importance in the development of integrated holistic approaches, in dealing with the Organization's many issues — environmental and cultural development, population, human rights and democracy, transcultural education, etc. — which pose challenges that cut across the boundaries between disciplines and even between fields of knowledge.

It is in fact incumbent on UNESCO, because of its intellectual vocation, to heighten awareness of the uniqueness and special relevance of transdisciplinarity, as an urgent challenge required by the increasing complexity of contacts and exchanges between specialized domains.

In this view, transdisciplinarity — working against the fragmentation of knowledge carried out in the name of the disciplines — represents a positive answer to those excesses of hyperspecialization, which have the tendency to become just sterile compartmentalization, and where intellectual obstacles reinforce institutional obstacles and vice versa.

1.2 — UNESCO Transdisciplinary Programmes, a brief overview

The concept of transdisciplinarity has achieved increasingly wide recognition within UNESCO. Faced with the speed of change and growing complexity of the world and with the new challenges of history, the Organization has endeavoured to introduce both greater flexibility and transdisciplinarity into all of its programmes' design and implementation.

In this light, UNESCO's action — increasingly designed in terms of transdisciplinary projects and developed on the basis of a thematic, rather than sectoral, approach — brings together various areas of knowledge and tries to find practical solutions to crucial problems of development whose intricacy calls for holistic methods.

These projects try to express, both conceptually and methodologically, this transdisciplinary approach which is of fundamental importance in seeking a better understanding of the modern world, as was shown during the debates at the last General Conference and, in particular, in the statements by the heads of delegation at the plenary sessions.
UNESCO representatives made all the participants in the Symposium aware of some of these transdisciplinary projects by clarifying their main distinctive features:

a. at the conceptual level, they deal in an integrated manner with questions that, although interdependent, had hitherto been considered separately, while,

b. at methodological level, they seek to combine, within a single action plan, the contributions of education, the sciences, culture and communication.

Among the many other transdisciplinary projects (e.g., MOST, MAB, Ethics of Science and Technology, Educating for a Sustainable Future, Learning Without Frontiers, etc.) the Universal Ethics Project was mentioned as one of the expressions of UNESCO’s long-standing concern to articulate a common, cross-cultural substratum of ethical values and norms. This substratum is intended to be used as the basis for collective efforts towards peace and development, as well as for peaceful and productive interaction among nations and societies. It was pointed out how the Universal Ethics Project tries to integrate the best of the current philosophical and ethical thinking of the global community, by involving individuals and institutions representing different disciplines, traditions and points of view, in the belief that the recognition of diversity need not lead to a relativism of values and norms.

In the end, UNESCO’s Culture of Peace Project was presented. It was explained how this major transdisciplinary project aims at promoting values, attitudes and behaviours that will empower people to seek peaceful solutions to problems. This project incorporates and integrates all the innovative projects and activities which all Sectors of the Organization are actively developing, together with a wide range of partners, to foster the advancement of a global movement for a Culture of Peace.

1.3 — UNESCO Transdisciplinary Programmes, preliminary insights

Through such projects and initiatives, UNESCO has learned how difficult and critical it is to establish a transdisciplinary approach.

It was explained that, while many of the attempts have been successful, others have shown the difficulties of inter-sectoral and inter-disciplinary co-operation. Nonetheless, the numerous ‘border incidents’, encountered in the course of these co-operations, have often proved to be fruitful.

One of the main things UNESCO has learned from its past experiences is that the mobility of knowledge does call for a permanent shifting of intellectual borders, as well as for the creation of a cross-border territory.

It has been clear, indeed, that there is no contribution, however modest in appearance or reality, which, under cross-fertilizing influences, cannot one day become the cornerstone of a new conceptual structure.
UNESCO has also realized how a strong disciplinary base is needed in all its fields of competence, if a transdisciplinary approach is to be effective, and, at the same time, how the true significance of individual disciplines appears only against the back-drop of transdisciplinarity.

Furthermore, UNESCO has realized what Prof. M. Sommerville clearly said during the Symposium:

«we speak the language of our discipline, which raises two problems: first, we may not understand the languages of the other disciplines; second, more dangerously, we may think that we understand these, but do not, because although the same terms are used in different disciplines, they mean something very different in each».

The theme of the International Symposium — “Transdisciplinarity: Towards Integrative Process and Integrated Knowledge” — openly suggested that the way to follow should be a continuous methodological attempt to define rules to cross the borders between disciplines.

In this view, UNESCO representatives agreed that trying to define a common, unambiguous and consistent methodological language would be the first path towards a fruitful, substantive transdisciplinarity.

Lastly, it was stated that UNESCO hoped to receive insights and methodological guidelines to orient its future actions from this Symposium, intended to be built not just on the imperative ‘we should’ or ‘we must’, but around the question of ‘how’.
2.1 — *A Metaphor for Transdisciplinarity*

2.2 — *A Symposium on Transdisciplinarity*
2.1 — A Metaphor for Transdisciplinarity

“Learning to bake a cake”

“A metaphor which I have found useful in describing the difficulties that we have in engaging in transdisciplinary activities, which really points to the need for better articulation of the methodological processes that can be used in developing transdisciplinarity, is that of a five years old boy who says to his mother, ‘I want to bake a cake’.

His mother gives him the ingredients – butter, milk, flour, eggs, sugar, flavouring, raisins – and he simply throws these into a bowl and stirs them with a wooden spoon. The result will be a lumpy mess, not a cake and probably not even a pancake.

The boy’s mother knows how these ingredients must be combined in order to achieve the necessary blending of them. Moreover, she knows that, depending on how she treats these ingredients – both before they are put into the mixture for the cake and the way in which they are introduced – she will obtain a very different kind of cake. For instance, if she separates the eggs whites from the yolks and beats the egg whites and lightly folds them in the last moment, she will have a sponge cake, as compared with, if she uses the eggs whole, a dense tea cake. In both cases, she ends up with a cake, but these are of very different natures.

Analogous variations may occur depending on how we treat and “mix” disciplines in the context of transdisciplinarity (...)».

Prof. Margaret A. Somerville
2.2 — *A Symposium on Transdisciplinarity*

At the beginning of the Symposium, some words of UNESCO Director-General Federico Mayor were recalled:

«the seeds of progress germinate, and the shape of the future unfolds in our conviviality, at the convergence of all our different paths. It is in this gradual cross-fertilization that the future of knowledge — and indeed of the world — resides».

These words set the tone for the many reflections that took place in the peaceful surroundings of Royaumont Abbey, on the following questions: What is transdisciplinarity? Why is it so crucial to have a theoretical focus on this concept? What global issues urge a transdisciplinary approach? How can we conduct research and evaluate transdisciplinarity?

In the following days, in the endeavour to address the many issues that surround the notion of transdisciplinarity, each topic was initially tackled through the personal contributions of “animateurs”, then by intense group discussions involving all participants.

In order to proceed to in-depth analyses, syntheses and further development of the four main topics, the participants organized themselves in working groups. Each group made a report to the plenary on the outcome of its discussions.

The colloquium, under the auspices of Prof. Rapport and Prof. Somerville, concluded that intellectual collaboration among all the participants and UNESCO would continue in the future.

The participants expressed their wish to work together on a regular basis also by establishing an Internet Web site and a Forum on Transdisciplinarity, consequently trying to recreate in virtual space a “daily physical proximity” that, as Prof. Somerville highlighted, is “a crucial factor to fulfil significant methodological and substantive results”.

Finally, the hope was that, by developing these synergies, the concept of transdisciplinarity could become more and more familiar within and without the academic environment, showing its utmost importance in achieving a more thorough knowledge of the complex reality of this end of millennium.
3.1 — Transdisciplinarity, integrative processes and integrated knowledge

3.2 — Transdisciplinarity, building a theoretical framework

3.3 — Transdisciplinarity, drawing a conceptual background

3.4 — Transdisciplinarity, an insightful approach for every issue?

3.5 — Transdisciplinarity, against the disciplines?

3.6 — Transdisciplinarity, beyond Multidisciplinarity and Interdisciplinarity
3.1 — Transdisciplinarity, 
*Integrative Processes and Integrated Knowledge.*

Out of the many reflections a central point arose:

The way to attain an integrated concept and practice of knowledge, and consequently to address many crucial issues of our age through a transdisciplinary approach, does not lie in applying ready-made, 'mechanical' procedures based on automatic, stereotyped formulas and standardized recipes; but rather, in establishing various complex, integrative processes to be mindfully and cautiously implemented in the light of manifold criteria.

Faithful to the spirit of the Symposium, the present report tries to represent the many complementary contributions in a small dossier-like structure.

By doing so, on the one hand, there is a wish to avoid a summary which might provide unreliable reductive sketches with illusive problem-solving scenarios.

On the other hand, there is a hope to increase thoughtful awareness on methodological and substantial matters concerning new holistic perspectives to better understand the world and address its various problems.

3.2 — Transdisciplinarity, building a theoretical framework

From a conceptual point of view, transdisciplinarity can be seen as a theoretical attempt to *"transcend disciplines"* and, by that, to react against *hyperspecialization* — a process leading to a dramatically growing fragmentation of knowledge — while at the same time maintaining the advantages of creativity and initiative peculiar to each specific field of knowledge.

In this sense, the Symposium aimed at finding significant points of agreement on the steps to be undertaken at the methodological level to elaborate a sound and unified transdisciplinary approach.

The general understanding was that, only by establishing a coherent theoretical framework, can an attempt be made to successfully cope with the crucial problems of our time and, then, to take into proper consideration the complex set of implications they give rise to.

The participants agreed on the main working hypothesis of the colloquium: finding out coherent methodological approach(es) to *"integrative processes"* as the way to achieve solid and substantial *"integrated knowledge"*. 
Consequently, the issue of a common transdisciplinary language, of a “transcendental language” or a “meta-language”, was explicitly raised throughout the Symposium (see §4.1).

Through several constructive confrontations, the participants succeeded in making distinctions among three apparently similar concepts: multidisciplinarity, interdisciplinarity and transdisciplinarity (see §3.6 and §4.1).

Eventually, after many thorough analyses, an initial set of methodological rules and elements to be applied for an approach to be transdisciplinary was successfully isolated (see §3.4 and §4.2).

A growing number of global issues were acknowledged as needing a transdisciplinary approach in order to be properly analyzed and addressed (see §4.3).

It was also recognized how the nature of reality itself, with its inherent complexity and multiform character, but at the same time with its deep unity, requires transcending the boundaries of single disciplines (see §3.3).

It was also observed that the probable reason for these global issues to necessitate a transdisciplinary approach is that they tend to reveal, more than others, the underlying complexity of reality (see §3.4).

As already mentioned, Mr. Federico Mayor once affirmed that the future of knowledge, and indeed of the world, resides in a gradual cross-fertilization resulting from the convergence of difference paths in a spirit of conviviality.

During the Symposium it emerged that such a cross-fertilization requires the development of a sound transdisciplinary perspective, of a new “intellectual space” in which to pursue the epistemological endeavour of widely and deeply exploring the very nature of the links to be established between single disciplines.

As Prof. Somerville highlighted,

"many of the “bricks” that we are using to develop our knowledge base for the future, are not new. The way in which we are organizing them prior to building, that is, the methodologies that we are developing to enable transdisciplinary activity to take place, are new. Moreover, as a consequence, some of the “buildings” that result, are new."

3.3 — Transdisciplinary, drawing a conceptual background

As a preliminary condition to increase understanding in the field of transdisciplinarity, attempts were made to clarify the perspective under which human knowledge was considered. Two ways of looking at knowledge emerged:
1. Attention was focused on the concept of "knowledge". In this view, a widespread interpretation of knowledge as "necessarily articulated in disciplines" — as disciplinary 'by nature' — was explored. It was agreed that in this framework the single disciplines should be seen as constitutive and taken as "autonomous branches", "distinct bodies" and "departments" of knowledge.

Therefore, by conceiving knowledge as structurally disciplinary, the construction of what was called a "transdisciplinary space" would seemingly become an intellectual exercise, theoretically interesting, but not necessarily more useful for addressing wider and deeper understanding of complex issues.

2. Similar attention was focused on the concept of "reality", by considering, and mostly recognizing, its intrinsic complexity and its multiform character, while highlighting at the same time its deep unity.

In this perspective, each discipline is not constitutive but just instrumental, as it is useful, at a first instance, to analyse difficult problems under a specific point of view.

Thus, a "transdisciplinarity approach" becomes essential insofar as the main intellectual aim coincides with a quest for a wider and deeper knowledge of a compound reality.

The outcome of these preliminary discussions on the conceptual background of a transdisciplinary approach was to recognize a complex and unitary profile of reality, which consequently calls for a unified approach to knowledge.

The debate on whether to assume a so-called "knowledge-based" perspective or a so-called "reality-based" perspective, acknowledged the relevance of a more "holistic" transdisciplinary approach to overcome, and to transform, a "reductionist" disciplinary approach.

A strong agreement was also reached on the idea that disciplines are not able to give an answer or even to isolate many problems whose solution would at once necessitate and provide a better understanding of reality (see §4.2).

Prof. Krimsky (Tufts University, USA) explained in this regard that transdisciplinarity «suggests that some questions are best treated by combining two disciplines, or at least their methods of analysis or theoretical frameworks».

He said that this can be better understood by considering the intrinsic transdisciplinary nature of certain classes of questions, as «there are certain classes of questions that transcend a single discipline. One such class of questions pertain to the synthesis of knowledge».

On this basis, it was also highlighted that many issues of fundamental importance for our society (e.g., "human freedom", "determinism", etc.) could not even be posed within the specific domain of single disciplines.
In the light of these initial epistemological steps, the concept of transdisciplinarity was attributed the utmost importance at the gnoseological level, inasmuch as it looked evident that the transdisciplinary approach is essential to enhance rational understanding.

Consequently, the whole symposium was carried out under the idea that adopting transdisciplinary approaches is a crucial step on the long and never-ending path of human knowledge.

3.4 Transdisciplinarity, an insightful approach for every issue?

At this stage, an additional question began to emerge: whether a transdisciplinary approach would be insightful not only for complex and global issues, but also for all kinds of issues.

Why and how to extend a transdisciplinary approach also to "simple" issues leads, again, to a twofold reflection:

a. on the one side, if only global and complex issues appear to "call" for a transdisciplinary approach, this could be solely because they tend to reveal, more than others do, the underlying complexity of reality;

b. on the other side, when the word "simple" is used, many assumptions on how to decide when and where to stop the analysis — consequently qualifying and defining an issue as "simple" — remain actually hidden.

Thus, the inquiry into a given "simple" issue should not necessarily be stopped at the very first level, even when that level seems to provide a satisfactory explanation. When time and resources allow, in-depth investigations bring deeper understanding also on "simple" issues by unveiling more exhaustive aspects.

For a given object of study, there are conceptual tools, which actually seem better suited than others. However, it should not be overlooked that this depends both on what is being looked for in a given issue, and on what kind and level of analysis one may want to have. Consequently, at any time, and for any given issue, an approach marked by intellectual humility would always be desirable.

At the methodological level, for instance, it could be recognized that, despite the fact that a given conceptual tool is currently being used — as it looked to be the most suitable at the present time — other perspectives could (and should) always be tried, if one wishes to increase knowledge on the issue or the understanding of the problem from a different viewpoint.
3.5 — Transdisciplinarity, against the disciplines?

During the Symposium, it was pointed out that, despite its great importance for major world problems of our time, the concept of transdisciplinarity is still viewed with scepticism and encounters some resistance in the field of social analysis and certain other sciences (natural and exact), affecting its acceptance as a fruitful way of thinking.

This resistance is often due to the suspicion that transdisciplinarity could threaten a disciplinary approach to knowledge and aim at supplanting it.

In this respect, it was made clear that there is no opposition, but rather intrinsic and necessary complementarity, between a disciplinary and a transdisciplinary approach to knowledge.

To picture this relationship, Prof. M. Sommerville and Prof. D. Rapport evoked a “spatial dynamics of transdisciplinarity”. The two conveners used the paired images of “intellectual innerspace” and “intellectual outerspace” to denote the area occupied by the various disciplines in connection with transdisciplinarity.

As Prof. Somerville specifically pointed out,

«Transdisciplinarity may even be described as “intellectual outerspace”. But to have an “outerspace” necessarily requires that there would be an “innerspace”, and this “innerspace” is provided by the disciplines. This means that we need to allow for the development of the disciplines, including the possibility of new disciplines, without inhibiting the development of the intellectual “outerspace” within which transdisciplinarity takes place. What we are seeking to do is to give this “outerspace” structure, without rigidity; to create an environment for the integration of knowledge which is intellectually credible and which would open up the possibility of gaining insights that would otherwise be unlikely to emerge (...)».

Consequently, reflecting on transdisciplinarity does not mean rejecting a disciplinary perspective, but rather enhancing the understanding of reality by means of a new conceptual framework.

It is thus of vital importance to articulate and systematize as much as possible methods and principles to begin framing a conceptual space where, through creative and imaginative interaction, it will be possible to explore integrative methodologies for the production of integrated knowledge.
3.6 — Transdisciplinarity, beyond Multidisciplinarity and Interdisciplinarity

Focusing on the articulation of methods and principles at the border between different disciplines means going a step beyond the notion of interdisciplinarity.

As Prof. Masini (Pontificia Università Gregoriana, Italy) explained:

«The difference between an interdisciplinary and a transdisciplinary approach is as follows: in the former, disciplines offer a parallel analysis of problems (...); in the latter, disciplines offer their specific approaches and even basic assumptions, to a dialogue, in order to address complex issues together. In the case of transdisciplinarity, approaches and even methods are developed in a joint effort, something which is indeed difficult in complex societies, but very necessary (...)»

Consequently, the shift of transdisciplinarity is from a parallel analysis of problems to the establishment of a common dialogue, which would address complex issues on the basis of shared approaches and methods.

On the basis of an actual working experience, Prof. Klein (Wayne St. University, USA) gave an even more specific example of the shift from multidisciplinary to interdisciplinary to transdisciplinary approach:

«In the fields of child development and problems of the handicapped, a “transdisciplinary” approach connotes more systematic delivery of health care than occurs in a “multidisciplinary” juxtaposition of specialists or “interdisciplinary” coordination of their expertise (...).»

«A “transdisciplinary” team participates in more thorough assimilation of knowledge. [Team members] work together, rather than in a sequential separation, to assimilate their knowledge and perspectives (...).»

This issue was thoroughly addressed by Working Group #1 and Working Group #2 (see §4.1.2 and §4.2.2).
What is Transdisciplinarity?
4.1.1 — Plenary #1
4.1.2 — Working Group #1

What makes Transdisciplinarity succeed or fail?
4.2.1 — Plenary #2
4.2.2 — Working Group #2

What global issues need Transdisciplinarity?
4.3.1 — Plenary #3
4.3.2 — Working Group #3

How do we research and evaluate Transdisciplinarity?
4.4.1 — Plenary #4
4.4.2 — Working Group #4
4.1.1 — Plenary 1: What is Transdisciplinarity?
Prof. Gavan J. McDonell (University of New South Wales, Australia)

Prof. McDonell started his reflection by making a clear distinction between the concepts of "multidisciplinarity", "interdisciplinarity" and "transdisciplinarity".

On the one hand he suggested calling "multi-disciplinary studies" a collaboration among experts, members of different disciplines, where the relation among them is associative, i.e. where the work of each of them is added to that of all the others.

On the other hand he suggested that in "interdisciplinary studies" the connection is relational, i.e. "the disciplines collaborate in such a way that each takes up some of the assumptions and worldviews and languages of the others".

In the view of Prof. McDonell, transdisciplinarity differs from interdisciplinarity in its capability to give birth to a "meta-language".

Specifically, in an interdisciplinary dimension, the single disciplines tend to establish only a rudimentary level collaboration. On the contrary, within a transdisciplinary dimension a common transcendent language arises, allowing the level of sharing needed to generate an entirely "new intellectual space" through which fragmentation of knowledge can be contrasted and issues properly addressed.

Transdisciplinarity therefore would exist, according to his model, "where the integrating relationship is taken to the extent of there being a transcendent language, a meta-language, in which the terms of all the participant disciplines are, or can be, expressed."

From this point of view, he clarified that the concept of transdisciplinarity "stands in a long line of endeavours to produce the linked accomplishments of integrated knowledge and universal language."

Prof. McDonell then recalled "L'Encyclopédie", the famous project of Diderot, d'Alambert, Condorcet and other "philosophes" which was intended to include all the knowledge worth knowing — as well as Umberto Eco’s speculation on the "search for a perfect language".

He stressed how "the hope that human endeavour was capable of producing forms of knowledge" which could express "reliable, comprehensive and universally rational accounts of the world" lies "in the search for comprehensive knowledge and universal language."

Consequently, Prof. McDonell shared his conviction on the importance of elaborating a transdisciplinary approach, which he sees as a "transdisciplinary relief". However, he also emphasized the need to be aware of the difficulties of this intellectual path.

In this regard, he drew a "suggestion from the claim about forms of knowledge being the production of specific forms of culture".

21
At first he affirmed that «where we have cultural differences, we are also likely to have cultural conflicts». He explained that he would use exactly the words “cultural conflict” to describe «the difficulties, the divergences, and the resulting “turf wars” which provide the symptoms that have drawn the concern of those organising this meeting in the hope of forging some transdisciplinary relief».

He shared his confidence that, to achieve significant outcomes in transdisciplinarity, it is essential to overcome the structural linguistic boundaries which separate one discipline from another as well as to engage in cross-cultural dialogues.

The interaction among disciplines, he explained, «does not involve simply an exchange of concepts, a sharing of information, a rustle of eager and enquiring conversation». This interaction «only takes place within an engagement, and very likely conflict, between cultures».

For one of the most important peculiarities of a cultural form, “any cultural form”, consists in «its possession of a distinctive language» and with all that consequently implies in terms of different worldviews, different conceptions on «the shared and the different, the familiar and the alien, the domestic and the exotic».

Thus, as Prof. McDonell identifies language as the first obstacle to the construction of a unified approach to knowledge, he suggests we turn to philosophy and to the analysis of language in order to compose the differences among disciplines.

Continuing this reflection, Prof. McDonell identifies two main philosophical “camps”.

The first camp, often called “postmodernism”, «emphasises and celebrates the fragmentation of knowledge and disciplines in our world». According to Prof. McDonell, many postmodernists would «dismiss the hope of integrated knowledge as a modernist and dangerous illusion».

He puts in the other camp those who «seek to put in modern terms the Enlightenment hopes of a universal reason, shared, emancipatory knowledge, and moral consensus on action». In this regard, Prof. McDonell explained that this hope «underlies the attitudes of many scientists and technologists towards their work».

He proceeded to an articulated confrontation between postmodernist authors — enemies of transdisciplinarity as persuaded by the impossibility of reaching agreed norms of meaning and of constructing meta-languages — and Jurgen Habermas who, with his ‘faith’ in a notion of universal reason and in a morality beyond cultural conditions and contexts, is considered the recent contributor to a long research programme in the theory of knowledge and social order.

Prof. McDonell concluded his presentation by stressing the need for mutual dialogue and respectful understanding.

There most certainly are, he said, «urgent needs for tolerant cooperation and productive discourse among the great scientific disciplines of contemporary
civilization). But in his opinion «a widespread, stable and influential basis for a shared identity of transdisciplinarity» is lacking at present.

Prof. McDonell suggested «to start by expanding our disciplinary communities into more cosmopolitan cultures». In his view, this expansion process should be approached «through the encouragement of mutually respectful processes of both reflection and understanding».

"Respect" is seen here as a fundamental ingredient for a transdisciplinary reflection which needs to synthesise many different, often contrasting, positions without annihilating their uniqueness.

This idea, as Prof. McDonell recalled, is well expressed by Gerard Delanty's position concerning a cosmopolitan model of cultural transformation.

In this conception, a «reflective discourse is more concerned with bringing to a heightened level of awareness cultural potentials and with recognising differences», more than to find quiescent unanimity at all costs, for «the aim of reflection is mutual understanding, not consensual agreement».

This conclusive thought, in the very words of Prof. McDonell, «can bear careful consideration» when one tries «to articulate the conditions for cooperations among different, and often contending, disciplinary cultures».
4.1.2 — Working Group #1:

What is transdisciplinarity?

Bearing in mind Prof. McDonell’s recommendation on the utmost importance of building up a “transdisciplinary language”, a “meta-language”, a “new common linguistic space” able to contrast effectively the current process of fragmentation of knowledge, Working Group #1 endeavored to elaborate a broad and shared definition of transdisciplinarity.

During the debate, several difficulties emerged regarding:

a) the danger of equivocal or non-univocal meaning of basic concepts like “knowledge” and “problem”;
b) the identification of transdisciplinarity as a methodology/process or as a content/discipline;
c) the presence and/or need of a “teleological component” in the definition i.e., whether the purpose of a transdisciplinary approach should be recognized either in a problem solving activity or in a broader non-instrumentalist aim.

After a preliminary debate, the participants decided to proceed to a “silent experiment”: working separately for a few minutes, each one was requested to contribute an individual definition of “transdisciplinarity”, to be put up for discussion and jointly analyzed.

Hereunder are the different definitions recollected:

Ms. Jacqueline Russel:

Transdisciplinarity is a process whereby culturally constructed boundaries of single disciplines are transcended in order to address problems from multiple perspectives to generate emergent knowledge.

Prof. William Newell:

Transdisciplinarity is transforming and integrating knowledge from all interested perspectives to define and address complex problems.

Mr. Luca Zarri:

Transdisciplinarity is integrating and transforming knowledge in order to better face, from multiple perspectives, the complexity of reality.

Prof. Gavan McDonnel:

Transdisciplinarity is integrating and transforming fields of knowledge from multiple perspectives to enhance understanding of problems to be addressed, in order to improve future choices.

Prof. Roderick MacDonald:

Transdisciplinarity is transcending partial knowledge to pluralize choice about alternative futures.
Prof. Thomas Warn:

Transdisciplinarity is something different from multidisciplinarity, interdisciplinarity and physics (or whatever other specific discipline). It is different from an all-inclusive approach, as it is different from a too general approach.

Prof. Julie Thompson Klein:

Transdisciplinarity is practicing knowledge in a reflexive manner that recognizes, not denies, the inherent plurality and complexity of the human condition.

Mr. Massimiliano Lattanzi:

Transdisciplinarity is not a discipline but an approach, a process to increase knowledge by integrating and transforming different gnoseological perspectives.

In the light of the definitions provided, it was possible to single out some “key ideas”, “elements”, “ingredients” to be necessarily included in a provisional definition of transdisciplinarity:

a. **Gnosis/Praxis**: an “active” element having a threefold connotation (“transforming”, “integrating”, “reconstitutive”) was isolated;

b. Inclusive **Embracement**: this was recognized as an inherent character of transdisciplinarity. It is also interesting to note how the maximum of generality is considered a limit to this quality (“not all-inclusive”, “not too-general”);

c. **(Self-)Reflective**: the need for a constant explicit unfolding of assumptions and values was widely recognized;

d. **Complexity**: this is a cardinal character of a transdisciplinary dimension (e.g. complex situations, complex knowledge, complex problems);

e. **Plurality** (e.g. multiple/diverse/different perspectives of knowledge);

f. **Future-oriented alternative choices**;

g. **Problem-solving component**: this teleological element is often present. Nevertheless, beside the concrete problem-solving aspect, a pure gnoseological dimension has to be considered to exhaustively define transdisciplinarity.

The conceptual elements isolated by this first working group were given back to the Plenary as a set of “ingredients” to be necessarily included in a preliminary theoretical definition of transdisciplinarity.

Moreover, this group agreed upon the methodological suitability to work on a first general non-instrumentalist definition of transdisciplinarity and therefore to educe from it a more pragmatic problem-oriented definition.
4.2.1 — Plenary 2: What makes Transdisciplinarity succeed or fail?
Prof. Anthony M. McMichael (University of London, England)

Prof. McMichael’s presentation focused on identification of the fundamental factors that allow transdisciplinarity to succeed. Before answering this question, he gave his own insights to the pivotal distinction between the concepts of interdisciplinarity, multidisciplinarity, and transdisciplinarity.

The term ‘interdisciplinary’ is often used loosely. It perhaps ought to refer more specifically to research topics and methods that occupy newly-recognised space between existing disciplines (or at least entail substantive interaction at the inter-disciplinary boundary). Instead, we often use it synonymously with ‘multidisciplinary’, to refer to collaboration between disciplines working alongside one another in the same sense that we use the term ‘international’ or ‘interdepartmental’ to refer to collaborations between governments and institutions (...).

The concept of transdisciplinarity goes beyond those of interdisciplinarity and multidisciplinarity, in the sense that it refers to something more complex and qualitatively different than the mere juxtaposition or combinations of different disciplinary fields:

«Multidisciplinary science is an assemblage of collaborating disciplines. The whole may or may not be greater than the sum of the parts. In transdisciplinary science, the whole is not just greater than its derivative disciplinary parts but it has qualitatively different properties. Further, transdisciplinary science integrates its contributory disciplines such that they are no longer evident as disaggregatable components. Perhaps, then, we are describing a type of science which has emergent properties that are not only different from, but not even necessarily predictable from, its contributory components (...)».

On this basis, according to Prof. McMichael, the two factors of “collectiveness” and “complexity” have to be primarily kept in mind for a transdisciplinary approach to succeed:

«Transdisciplinary science (...) is by definition a collective enterprise arising in response to the need to use humankind’s knowledge and analytic powers to understand large and complex systems that are not referable to the intellectual framework of any single scientific discipline or set of disciplines (...)».
Beside them, "synergy" and "co-operation" were isolated as two other crucial components of transdisciplinarity:

"Transdisciplinarity entails a synergy between contributory disciplines - between their conceptual modes and information sets. This synergy, and the resultant emergent properties of the scientific discourse and conceptualisation, are most likely to occur when a diverse mix of scientists cooperatively tackle research questions that are embedded in large, complex and dynamic systems (...)"

In the end, Prof. McMichael, referring to the characteristics of the ideal participants to a transdisciplinary research programme, highlighted the concepts of "willingness to trust" as well as "mutual interest and commitment", identifying these individual attitudes as additional crucial components for the success of the endeavour.

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Furthermore, it has to be mentioned that, in the perspective of transdisciplinarity, Prof. McMichael, felt the importance of briefly touching the issue of reductionist approach in Western science. In this view, he stressed how the classical methods of Western sciences conceive complex wholes as being reductively fractionable in a series of "lego-like" components to be analyzed in a mono-disciplinary way:

"There have always been complex, multi-faceted, problems for scientists to think about. However, the classical methods of Western science are explicitly reductionist. With this reductionism, we can learn about the complex whole by separate studies of its component parts; we dis-assemble, fractionate, and confine our gaze (...). Classical science assumes a lego-like world, reducible to manageably researchable parts. There is no expectation that the whole will behave other than recognisably as the sum of its parts (...)"

On the contrary, as he urged,

"there is a need for approaches that can transcend the limited horizons of existing disciplines and can look to wider horizons, thereby accommodating new dimensions of complexity, scale and uncertainty (...)"

He recalled the thoughts of Ravetz and Funtowicz who have described the methods of the "soft-sciences" as

"free of reductionist and mechanistic assumption about the way things relate and the way systems operate, (...) and of the traditional expectation that science should deliver final precise estimates unshrouded by uncertainty (...)"
The central point of this criticism is that

«some complex systems (...) may not be reducible to model specification (...) and that science should not aspire to uncertainty-free exactitude (...)».

The final request of Prof. McMichael was to continue the struggle for the establishment of transdisciplinary approaches in science, following the way of the many scientists, who

«have made explicit attempts to define approaches to research that free themselves from the tenets and processes of orthodox empirical reductionist science (...)».

He concluded with the hope that the methods of “soft-sciences” will be able to influence the “hard-sciences”, stressing that those who decide to approach the notion of transdisciplinarity have to be

«ready to feel comfortable with uncertainty and not to be fearful of ignorance». 
4.2.2 — Working Group #2:

*What makes transdisciplinarity succeed or fail?*

To further explore the conditions that make transdisciplinarity succeed, Working Group #2 developed Prof. McMichael’s distinction between *interdisciplinarity* and *transdisciplinarity* by focusing on a specific quote:

> «In transdisciplinary science, the whole is not just greater than its derivative disciplinary parts, but it has qualitatively different properties. Further, transdisciplinary science integrates its contributory disciplines such that they are no longer evident as disaggregatable components.»

The greatest attention was given to this thought of Prof. McMichael, which hinted at the "transformative properties" intrinsic in a transdisciplinary approach.

It is interesting to note that, by making explicit reference to the notion of "transformation", Working Group #2 upheld, through a fascinating integration, the findings of Working Group #1. The latter was, at that very moment and behind closed doors, trying to define the concept of "transdisciplinarity" by exploring complementary issues.

In fact, the element of "transforming" praxis isolated by Working Group #1 is logically coincident with the "transformative properties" isolated by Working Group #2.

In both cases the active property of inducing a qualitative transformation of the reality gets attributed to transdisciplinarity.

Furthermore, Working Group #2 stressed that, in a transdisciplinary project, the team is supposed to work in such a way that "people themselves" — and not only "knowledge" — should undergo a "transformative process" and, consequently, "become trans".

In this light, Dr. Desmond Manderson proposed a new definition of transdisciplinarity, more closely related to the complex but essential concept of "transformation", which constitutes a remarkable complement to the many others provided by Working Group #1:

> «Transdisciplinarity can be characterized as a transformative practice of knowledge.»

Proceeding towards a broad agreement upon the *key factors* needed to make transdisciplinarity succeed, Working Group #2 endorsed the proposals of Prof. McMichael and corroborated the need for "mutual interest" and "willingness to trust", as well as the capacity to be "ready to feel comfortable with uncertainty" and "not to be fearful of ignorance", identifying all of them as crucial ingredients for a successful transdisciplinary approach.
4.3.1 — Plenary 3: *What global issues need Transdisciplinarity?*

Prof. William S. Fyfe (University of Western Ontario, Canada)

Prof. Fyfe focused in his talk on what he believes to be the global issues most urgently in need of a transdisciplinary approach.

In addressing this topic, he did not make reference to any specific theoretical system of thought, but rather preferred to present a series of concrete examples of failure and success in transdisciplinarity drawn upon his professional experience.

A world with a human population moving to 10 billion, he explained, with Europe and North America making up only 13% of population and with the rich-poor gap growing, calls for sustainable life support systems i.e., systems that will not lead to the destruction of the planet.

Prof. Fyfe highlighted how our standards of living and quality of life are related to such systems, whose most basic ingredients include energy, food, water, air, materials and biodiversity.

He also brought up the problem of food security, as a topic implying a transdisciplinary approach, for it is related to factors like fluctuating climate, soil quality, water quantity and quality, acid rains, ozone, etc.

Prof. Fyfe continued by pointing out how the growing complexity of the most significant issues of our time requires an increasing active contribution of teams of experts having different and complementary cultural backgrounds.

To use his own insightful words:

«Specialists cannot deal with these problems». 

He made reference to projects in which he is personally involved, clarifying how:

«slowly we are beginning to accept the need for new teams to solve problems».

These projects are actually built around several “transdisciplinary teams”:

«At a minimum we need biologists, soil scientists, water specialists, geochemists, climatologists, engineers and, as always, economists and sociologists. With the sociologists I include all involved in education (...)». 

In closing, Prof. Fyfe came back to this last idea, by stating that:

«Above all we need new education (...), since education is determinant for any real freedom that peoples may achieve». 

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4.3.2 ― Working Group #3:

*What global issues need transdisciplinarity?*

Developing a collective reflection on the basis of Prof. Fyfe's stimulating speech in the course of the third plenary session, the participants endeavoured to widen the perspective implicit in his talk, mostly focused on environmental problems.

The debate isolated four global issues that, according to the group, would mostly benefit from a transdisciplinary approach:

a. *Human aggression;*
b. *Harmonious distribution of resources;*
c. *Development of anthropocentric world views;*
d. *Realization of human potential and empowerment through education.*

Particular urge was expressed for the world to undertake "a shift from aggression to harmony", a harmony which should characterize relationships among human beings as well as between humans and other living beings.

In this regard, the working group identified *education* as a crucial topic of our time. It was specifically recalled — and stressed — the final part of Prof. Fyfe's contribution:

> «We need universal literacy, numeracy and science education; but above all we need a new education.»

Moreover, the participants devoted their attention to "**Transectorality**," a concept calling for thorough reflection and specific analyses. A significant level of consensus was reached on the utmost importance to consider transectorality *in close relation* with the notion of transdisciplinarity.

Consequently, it was urged to convey and to "**transfer**" to the concept of transectorality the many reflections started and the elucidation achieved on transdisciplinarity.

There was a specific suggestion to make use of the new definition of transdisciplinarity jointly presented by this working group, where the notion of "**integration**" was highlighted once more:

> «Transdisciplinarity is the process characterized by the integration of efforts by multiple disciplines to address issues or problems»

The findings of this Working Group were eventually integrated in a broader perspective, where it is hinted that a transdisciplinary approach can produce insightful outcomes also when applied to 'simpler issues' (see §3.4).
To overcome "the intrinsic limits of a mono-disciplinary perspective to global issues", Prof. Masini stressed the need to apply a transdisciplinary approach to problem-solving.

She made reference to a significant study of the Club of Rome devoted to the so-called "global problematic" i.e., an ensemble of problems requiring "a plurality of approaches" provided by "many disciplines" together with a "planetary perspective".

Prof. Masini made clear that, to characterize this study, which in the 70s had a significant impact on the academic community, the concept of "interdisciplinarity" should preferably be utilized.

In fact, in Prof. Masini's conception of interdisciplinarity, «disciplines offer a parallel analysis of problems», while in a trasdisciplinary perspective «disciplines offer their specific approaches and even basic assumptions, to a dialogue, in order to address complex issues together».

Further developments in the field of "future studies" have seen an intensified perception of the importance of transdisciplinarity with an increasing awareness on the need for a "closer coordination", an "integration" among different disciplines.

Prof. Masini explained that the need to develop effective "approaches and methods" through a "joint effort" became clear, and how this can be achieved only in a transdisciplinary perspective.

Nevertheless, she pointed out how transdisciplinarity is still perceived with scepticism, thus encountering resistance in many fields of human and natural sciences.

Moreover, she added that transdisciplinarity, even though difficult to conceive in theoretical terms, should not be seen as an abstract notion lacking of any significant application, since, on the contrary, it is already being used by "Future Studies".

Future studies as well as their techniques, e.g. "Delphi" and "scenario-building", are examples of "global models" and "definitely transdisciplinary". They attempt to "extrapolate trends of the past into the future" and, on this basis, to build an image of the future itself. This is done through "methods" aiming at "bringing closer" the "basic assumptions of various disciplines" to perform "extremely rigorous" although "non-predictive" analyses.

Prof. Masini identified in this threefold quality of being "global", "transdisciplinary" and "non-predictive" the explanation of the many criticisms directed at Future Studies, based on the «awareness that the many variables necessary to understand the world are difficult to constrain in global mathematical models».
To further elucidate the concept of transdisciplinarity, Prof. Masini shifted attention to the notion of *multidimensionality*.

At first she went over Yehezekel Dror’s idea that in Future Studies there is not only a relationship between disciplines, but also a contribution from various different “backgrounds”, “schools of thought” and “cultures”.

Then she highlighted how Dror draws a correspondence between the two notions, by saying that

*«multidimensionality and transdisciplinarity are the opposite of specialization, (...) which is itself part of the search for greater and greater detail in the natural and social sciences ».»*

In closing, Prof. Masini underlined in a clear and unambiguous manner the decisive role of transdisciplinarity in addressing complex societal issues in the age of globalization:

*«Thus transdisciplinarity can be said to be crucial at this point in time for historical reasons and to address a rapidly changing society. Without transdisciplinarity we risk making mistakes of such gravity as to threaten the very survival of humanity. In an age of specialization, unless transdisciplinarity is recognised as an important tool for understanding a complex and rapidly changing society, dangers are ahead or already in the making ».»*
4.4.2 — Working Group #4:

How do we research and evaluate transdisciplinarity?

To analyze the issue of research and evaluation of the processes in which a transdisciplinary approach is expected to be used, the participants of Working Group #4 referred to Professor Masini’s report on her research.

A working definition of transdisciplinarity, assumed as main reference for the internal discussion was elaborated. In their view, "transdisciplinarity is conceived as a multiplicity of disciplines that must integrate to solve a problem".

Based on this ‘problem-solving-oriented’ instrumental conception, essential steps to undertake fruitful research based on a transdisciplinary approach were isolated.

An “unambiguous” definition of the “research object” was identified as preliminary requirement. Consequently, it was stated, a clear outline of the most important goals of the research itself should also be provided.

It could be noted that, although at a first instance it would seem inappropriate to edge in advance the aim of a research — and consequently to force its possible unexpected findings into an a priori frame — an explicit unmistakable description of the conceptual framework of the inquiry has been proved fruitful exactly when, as it is often the case, a reorganization of the research itself is needed.

Furthermore, it was made clear how the transdisciplinary team has to be preferably formed by people having “different cultural backgrounds”.

It was a widely accepted opinion that this team is supposed to utilize transdisciplinary processes and methods of analysis to reach an immediate provisional outcome, which has to be immediately evaluated.

It was suggested that as fruitful evaluation technique one could try to answer questions like:

a. does the outcome meet the goals fixed at the beginning of the research itself?

b. does the outcome show an underlying consistent way of inquiry?, etc.

This outcome, once methodologically analyzed, should be used as input for new transdisciplinary investigations to be carried out both within the same research programme and in other theoretical domains.

Future disciplinary practices are also supposed to be positively affected by this feedback: this is a further element endorsing a conception of transdisciplinarity not alternative but rather complementary to the notion of “discipline”.

In this view, the development of transdisciplinary methods and principles is intended to support the various disciplines in increasing their cohesion and consistency.
Conclusion:

Transdisciplinarity as self-transformation
Conclusion: Transdisciplinarity as self-transformation

This Symposium gave definite shape to a widespread need: beginning a systematic attempt to overcome the limitations of the present knowledge base, increasingly perceived as unable to address crucial issues of this time. This process entails a fundamental implication, going beyond the habit of approaching problems in a "mono-disciplinary" way.

Eight thousand five hundred and thirty (8,530) definable fields of knowledge were recognized in a study conducted in 1992, as the result of both increasing specialization and overlapping domains. During the Symposium it was made clear how historically drawn boundaries between disciplines should be re-examined, and that space has to be given to "new strategies of integration of knowledge".

At the same time, the need to overcome some already existing perspectives was stressed. Such traditional approaches, while hinting at new dimensions of knowledge, remain fundamentally tied to disciplinary limitations.

This is the case for those forms of "multi-disciplinarity" which consist of the juxtaposition of several mono-disciplinary approaches, as well as for an "inter-disciplinarity" which involves interactions only at the margins of individual disciplines; these interactions mostly focus on the findings, entirely leaving out theories and methods.

Both multi-disciplinarity and inter-disciplinarity are not effective remedies to the ongoing fragmentation of knowledge inasmuch as, through simple juxtaposition or assemblage of approaches, they do not reach the dimension of "integration" required by the fundamental unity underlying all forms of knowledge.

* * *

The notion of "integration" was clearly set as the scope of this Symposium, where the concept of "trans-disciplinarity" was seen as the "path back from the chaos", the "antidote to fragmentation of knowledge", the way "towards integrative processes and integrated knowledge".

It was particularly identified that "problems are such because they are addressed too narrowly". Indeed, the means to address global and complex issues do not lie in interdisciplinary approaches, in which different disciplines are converging but not interacting. A widening of perspectives is required.

The answer, could be found in a "trans-disciplinary dimension", where a mere parallel analysis of a problem from various disciplines is overcome by a dialogue starting from the different assumptions of segmented domains.

This dialogue is intended to bring to light hidden glimpses of unquestioned assumptions, and to unfold them into explicit methodologies on which the analysis can be focused.
Conceptual and methodological tools must be rethought. The fundamentals of each discipline re-examined to reveal their conceptual presuppositions and limitations.

On the basis of these analyses, integrated approaches can be found, as profound connections among disciplines can be identified at methodological level.

Transdisciplinarity is therefore conceived as "meta-methodology": a transdisciplinary approach takes as its object precisely the different methodologies of the various disciplines, in order to "transform" and to "transcend" them.

Transcending and transforming are seen here not as vague procedures to replace disciplinary methodologies with global, fuzzy, problem-solving techniques.

On the contrary, they are conceived as rigorous processes of abstraction, inasmuch as a transdisciplinary approach, intended to tackle global problems, needs to be general without being generic.

At the same time, these processes must not be rigid, since facing complex issues calls for a continuous critical reflection on the criteria to be used in "transforming" and adapting conceptual tools to many variable factors.

* * *

A transdisciplinary approach is not only helpful to better address crucial 'known' issues. It also makes new problems emerge, as some problems are unthinkable due to the lack of an adequate structure of knowledge.

In this regard, transdisciplinarity helps in facing the complexity of reality, through the generation of new metaphors to communicate thoughts and to increase knowledge.

Transdisciplinarity opens the eyes and widens perspectives since, to improve understanding, it uses concepts not owned by a single discipline. Transdisciplinarity is the intellectual space where the nature of the manifold links among isolated issues can be explored and unveiled.

Through the metaphors engendered in such intellectual space, issues can be re-thought, alternatives can be re-considered, inter-relations can be revealed. A whole range of causes can be delineated and evaluated in unusual ways.

Several metaphors were used during the Symposium, to help in the comprehension of complex or abstract issues. Most of them were intended to clarify the differences among multi-, inter-, and trans-disciplinary ways of approaching problems, and to highlight the need for a shift towards transdisciplinarity.

* * *

Multidisciplinarity can be seen as a banquet where various people bring different dishes, all of which are placed on a table. The outcome of the juxtaposition is merely accidental. Many people could bring the same dish. Others could bring totally
unexpected food. There is room for a high risk of waste of resources and for a lack of coherence.

Interdisciplinarity can be seen as a banquet where various people bring different dishes, independently selected by knowing what the others are not bringing. To improve presentation and taste of the food, all dishes are entirely or partially combined at the last minute to compose new courses. The outcome of the assemblage lies in the final work of composition, which is solely responsible for minimising waste and maximising coherence.

Transdisciplinarity, meanwhile, is like a banquet where various people have collectively decided in advance what to cook using the ingredients and the expertise available, and they bring many dishes prepared in collaboration. Nobody can tell to whom the various elements belong and who composed them: the team-work has to be acknowledged.

In the transdisciplinary banquet there is an optimal use of resources, as no dish is partially utilized, or just left over. There is an optimal concordance of tastes, as a great amount of time is spent in conceiving the many dishes in advance exactly with a view to their integrated fruition. The team-members acquire new expertise through their interaction. They improve their capacity of listening. They learn that they can produce a successful outcome, although they are not in possession of all the ingredients, neither are they familiar with all the cooking procedures. They understand that, when they are not doing the entire job — their entire job — they are paradoxically, all together, getting the job done.

* * *

The metaphor of the banquet can be "trans-posed" to bring some light on the work of a group of experts trying to address an issue. This exemplification elucidates once more the different perspectives of multi-, inter-, and trans-disciplinary approaches.

In a multidisciplinary approach, a series of experts belonging to different disciplines are separately requested to prepare a dossier where an issue is globally tackled. Although the experts are aware of each other, they try, without any exchange of information or meeting, to wholly address the issue by using theories and methods of their own disciplines. The outcome is a set of dossiers thoroughly analyzing the problem, without any substantive interaction between the experts and the disciplines.

On the one hand, this approach is an improvement in respect to a mono-disciplinary one, as it does reveal multiple points of view.

On the other hand, by proposing a juxtaposition of different viewpoints, this approach leaves out the possibility of assembling the various perspectives in a sort of soundly-composed unique view.

This means that, by reading the dossiers, one would most likely run into all sorts of contradictory statements on the nature of the issue, on the possible ways of analyzing it, and on the possible solution(s) to be implemented. Basically there would easily be a great level of discordance on what is under study, on how to study it, on what are
the pertinent elements to take into account, on what are the possible acceptable ways of addressing the issue, etc.

The immediate outcome would be that, out of such a richness of perspectives and variety of analyses, not a single coherent operative proposal could possibly come up.

* * *

In an interdisciplinary approach, a series of experts belonging to different disciplines are separately requested to contribute to a dossier by preparing an essay where a specific aspect of a complex issue is examined.

The experts are aware of each other, but they are also aware that they are focusing on different aspects of the problem. As the specific topics were already attributed to each discipline on the basis of the traditional definition of its knowledge domain, the experts exchange information just to find a final agreement on the boundary given to each other. Once the borders are set, each expert unquestionably uses theories and methods of the specific discipline selected to better address the specific topic.

Eventually, once the research papers have been finalized, an interaction among the experts takes place, in the form of information exchange on the findings or on the working methods of the different disciplines.

Thus, any possibility to compose the different perspectives and the various analyses into coherent operative proposals resides in the final activity of the person(s) compiling the individual papers. Solely this conclusive assemblage — and maybe an introduction prepared ‘ad hoc’ — is supposed to make the essays interact ‘a posteriori’.

Otherwise, the inter-disciplinary dossier would look like a mere collection of isolated multi-disciplinary essays.

* * *

In a transdisciplinary approach to a given issue, a team of experts reflects together, as they are supposed to redraw the traditional grid, which segments the issue into disciplines.

In this exercise they have to consider each discipline as relevant, but none of them as hegemonic. They have to re-create the object of study by considering it under many different viewpoints. They have to try focusing mainly on the kind of connections, which have not been considered before. They have to communicate. They have to cross the entrenched border of their own disciplines by exchanging ideas and different perspectives. They have to find new metaphors for sharing and understanding.

They have to increase their mutual awareness on the problems, by multiplying the ways in which ideas are expressed. They have to get into a self-critical disposition, by putting up for discussion their many views on the issue.
In a transdisciplinary dimension, people get transformed into a team, as transdisciplinarity is intended not only as integration of knowledge on a considered object but, mainly, as mutual assimilation of understanding among the examining subjects.

In a transdisciplinary dossier, one does not perceive whether a specific paragraph is written by the lawyer or by the sociologist; as one does not distinguish between the contribution of the physicist and the one of the anthropologist; or between the point of view of the biologist and the one of the epistemologist.

As in an orchestra, everybody plays a part of the score making use of the various insights received by the colleagues and, together with them, tries to convey consonance and harmony into a symphony.

* * *

In the XVI century, Montaigne asserted that "the most universal quality is diversity".

Transdisciplinarity has to be a space where there is room for diversity, for respectful confrontation and mutual transformation. It has to be a space where people strive for synergy, as much as they are willing to trust, to be comfortable with the uncertainty, and not to be fearful of their ignorance. As the real issue is not in what one knows or does not know, but in what one assumes to know.

As well synthesised by Dr. Manderson, transdisciplinarity has to be "the meeting point of people and minds". It has to be an encounter among "transformed people" with a "scientific mind" that, as Francis Bacon remembers, is a mind

«nimble and versatile enough to catch the resemblance of things, and at the same time steady enough to fix and discern their subtle differences; endowed by nature with the desire to seek, patience to doubt, fondness to meditate, slowness to assert, readiness to reconsider, carefulness to set in order; neither affecting what is new, nor admiring what is old, and hating every kind of imposture». 
Reference Materials
The International Center of Transdisciplinary Research (CIRET), a non-profit organization located in Paris since 1987, has a joint project with UNESCO on "Transdisciplinary evolution of the University".

The Charter of Transdisciplinarity was adopted at the First World Congress of Transdisciplinarity, held in Portugal in November 1994, with the patronage of CIRET.

**CHARTER OF TRANSDISCIPLINARITY**

*(adopted at the First World Congress of Transdisciplinarity, Convento da Arrábida, Portugal, November 2-6, 1994)*

**Preamble**

Whereas the present proliferation of academic and non-academic disciplines is leading to an exponential increase of knowledge which makes impossible any global view of the human being,

and Whereas only a form of intelligence able to grasp the planetary dimension of current conflicts could face the complexity of our world and the present challenge of a material and spiritual self-destruction of the human species,

and Whereas life on earth is seriously threatened by the triumph of technoscience which obeys only the frightening logic of productivity for productivity's sake,

and Whereas the present rupture between an increasingly quantitative knowledge and an increasingly impoverished inner identity is leading to the rise of a new brand of obscurantism whose individual and social consequences are incalculable,

and Whereas the historically unprecedented growth of knowledge is increasing the inequality between those who possess and those who do not, thus engendering increasing inequality within each nation and between the different nations of our planet,

and Whereas, at the same time, these challenges also have a positive counterpart whereby this extraordinary development of knowledge could eventually lead to an evolution not unlike that of the primates into *homo sapiens*:
In consideration of all the preceding, the participants of the First World Congress of Transdisciplinarity (Convento da Arrabida, Portugal, 2-7 November 1994) have adopted the present Charter, which comprises the fundamental principles of the community of transdisciplinary researchers, and constitutes a personal moral commitment which every signatory of this Charter makes, without any legal or institutional constraint.

Article 1:

Any attempt to reduce the concept of human being to a mere definition and to reduce it to a formal structure, no matter what, is incompatible with a transdisciplinary vision.

Article 2:

The recognition of the existence of different levels of reality governed by different types of logic is inherent in the transdisciplinary attitude. Any attempt to reduce reality to one single level governed by a single form of logic is incompatible with transdisciplinarity.

Article 3:

Transdisciplinarity complements the disciplinary approach. Out of the dialogue between disciplines it produces new results and new interactions between them. It offers a new vision of nature and reality. Transdisciplinarity does not seek a mastery in several disciplines but aims to open all disciplines to what they have in common and to what lies beyond their boundaries.

Article 4:

The keystone to transdisciplinarity is the semantic and effective unification of the distinctions between what runs through and what is beyond different disciplines. It presupposes an open-minded rationality, through a fresh look at the relativity of such notions as "definition" and "objectivity". An excess of formalism, rigidity of definitions and a claim to total objectivity, implying the exclusion of the subject, can only have a negative effect.

Article 5:

The transdisciplinary vision is determinedly open in that it transcends the field of the exact sciences by encouraging them to communicate and be reconciled with not only the humanities and the social sciences, but also with art, literature, poetry and spiritual experience.

Article 6:

In relation to interdisciplinarity and multidisciplinarity, transdisciplinarity is multireferential and multidimensional. While fully recognising the various approaches to time and history, transdisciplinarity does not exclude a transhistorical horizon.
Article 7:

Transdisciplinarity constitutes neither a new religion, nor a new philosophy, nor a new metaphysics, nor a science of sciences.

Article 8:

The dignity of the human being is both of planetary and cosmic dimensions. The appearance of human beings on Earth is one of the stages in the history of the Universe. The recognition of the Earth as our home is one of the imperatives of transdisciplinarity. Every human being is entitled to a nationality, but as an inhabitant of the Earth is also a transnational being. The acknowledgement by international law of this twofold belonging, to a nation and to the Earth, is one of the goals of transdisciplinary research.

Article 9:

Transdisciplinarity leads to an open attitude towards myth, religion and towards those who respect them in a transdisciplinary spirit.

Article 10:

No single culture is privileged over all other cultures. The transdisciplinary approach is inherently transcultural.

Article 11:

An appropriate education should not value abstraction over other forms of knowledge. It should teach contextual, concrete and global approaches. Transdisciplinary education is founded on the reevaluation of the role of intuition, imagination, sensibility and the body in the transmission of knowledge.

Article 12:

The development of a transdisciplinary economy is based on the postulate that the economy should serve the human being and not the reverse.

Article 13:

The transdisciplinary ethic rejects any attitude which refuses dialogue and discussion, no matter whether the origin of this attitude is ideological, scientistic, religious, economic, political or philosophical. Shared knowledge should lead to a shared understanding based on an absolute respect for the collective and individual diversities united by our common life on one and the same Earth.
Article 14:

*Rigour, openness, and tolerance* are the fundamental characteristics of the transdisciplinary attitude and vision. *Rigour* in argument, taking into account all existing data, is the best barrier to possible distortions. *Openness* involves an acceptance of the unknown, the unexpected and the unforeseeable. *Tolerance* implies an acknowledgement of the right to ideas and truths opposed to our own.

Final Article:

The present *Charter of Transdisciplinarity* was adopted by the participants of the first World Congress of Transdisciplinarity, with no claim to any authority other than their own achievements and activities. In accordance with procedures to be agreed upon by transdisciplinary-minded researchers of all countries, this *Charter* is open to the signature of any person interested in promoting progressive national, international and transnational measures to ensure the application of these Articles in everyday life.

*Convento da Arrábida, 6th November 1994*
Some considerations on Transdisciplinarity

In a world of increasingly rapid and interrelated change, it is obvious that it is not possible to look at social problems or issues from one point of view or perspective.

The complexity of problems is such that it is necessary to address issues using a variety of different disciplinary approaches. Hence, the need for cooperation among disciplines, hence the need for interdisciplinarity as a principle (if not a practice), hence the importance of multiculturalism (…).

Looking ahead needs not only many disciplines looking at problems, but also a coordination of disciplines. It was on this basis that transdisciplinarity emerged.

The difference between an interdisciplinary and a transdisciplinary approach is as follows: in the former, disciplines offer a parallel analysis of problems (…) ; in the latter, disciplines offer their specific approaches and even basic assumptions, to a dialogue, in order to address complex issues together. In the case of transdisciplinarity, approaches and even methods are developed in a joint effort, something which is indeed difficult in complex societies, but very necessary (…).

For some authors, the concept of transdisciplinarity is enriched by multidimensionality. Yehezekel Dror believes that (…) not only there is a relationship between disciplines, but also a contribution from different backgrounds, schools of thought and cultures (…).

Multidimensionality and transdisciplinarity are the opposite of specialization, one of the characteristics of the industrial age, which is in itself part of the search for greater and greater detail in natural and social sciences (…).

Thus transdisciplinarity can be said to be crucial at this point in time for historical reasons and to address a rapidly changing society. Without transdisciplinarity we risk making mistakes of such gravity as to threaten the very survival of humanity. In the age of specialization, unless transdisciplinarity is understood as an important tool for understanding a complex and rapidly changing society, dangers are ahead or already in the making (…).

Experiences with Transdisciplinarity – Successes

For almost a decade in the framework of the United Nations University I developed comparative research on the effects of macro-events on the unit family and on women in eight developing countries (…). The whole of the first year of the research was devoted to identifying a transdisciplinary approach suited to such a vast multicultural project.
Eight groups of researchers in each country had to accept the transdisciplinary approach and methods (...). They indeed showed that it is possible to have transdisciplinary research involving women researchers in totally different cultural contexts. The success was mainly due to commitment and openness of the (mostly young) researchers involved in the project.

**Experiences with Transdisciplinarity – Failures**

What was lacking was the will to work in a transdisciplinary way, that is the necessary humility to try and find a common set of basic principles which could be followed by methods of analysis that were gradually accepted by all. Each participant was very strong and absolutely sure of his/her discipline and standing and unwilling to find a common starting point (...).

The project could have been an important moment of reflection, ten years prior to the emergence of the key issue of the discrepancy between development as economic growth and development as related to all aspects of the human being(...). The unwillingness to work in a transdisciplinary manner was the default (...).

In the [successful] example there was instead (...) a willingness of the people involved to work in a transdisciplinary way, even at the risk of losing their own strong disciplinary approach, and (...) the objective was more important than the personality.
Disciplines as cultures: towards reflection and understanding

[Transdisciplinarity] stands in a long line of endeavours to produce the linked accomplishments of integrated knowledge and universal language (...).

In the search for comprehensive knowledge and universal language lay the hope that human endeavour was capable of producing forms of knowledge which could express reliable, comprehensive and universally rational accounts of the world (...).

Broadly and starkly expressed (...) in recent theorising on the conditions for the social production of knowledge, there are two polar camps in philosophy and social theory: one, often called postmodernist, and much the more popular and influential, emphasises and celebrates the fragmentation of knowledge and disciplines in our world (...). Those in the other camp seek to put in modern terms the Enlightenment hopes of a universal reason, shared, emancipatory knowledge, and moral consensus on action (...).

I want to outline a project which (...) seeks to develop, as a first stage, cosmopolitan discourses of reflection and understanding among diverse cultures, including diverse cultures of knowledge. It is in this direction that I suggest we should move in considering the possibilities of cooperation among disciplines (...).

I regard a discipline as residing in a cultural formation comprising a group of people who, both explicitly and implicitly, share and practice a form of scientific and professional knowledge which they regard as distinct. There is necessarily involved here a shared acceptance, also both explicit and implicit, of structures of uncertainty and ignorance (...).

I would like to suggest that we call ‘multidisciplinary studies’ a collaboration among experts, members of different disciplines, where the relation among them is associative, ie where the work of each of them is added to that of all the others (...).

In ‘interdisciplinary studies’, I suggest, the connection is relational, ie, where the disciplines collaborate in such a way that each takes up some of the assumptions and worldviews and languages of the others (...).

Transdisciplinary therefore would exist, according to this model, where the integrating relationship is taken to the extent of there being a transcendent language, a metalanguage, in which the terms of all the participant disciplines are, or can be, expressed (...).
Disciplines as cultural forms

I want to introduce a claim about knowledge (...) in that its various forms are cultural productions arising from specific forms of culture. I want to suggest that from this it follows that a form of knowledge culture comes with, indeed is constituted in, a form of language, a custom of practice, an economy of means, a structure of power, a rule of justice, an archive of narratives of identity and tradition. And at all these levels – language, practice, means, rewards, power, justice, identity, tradition – change constantly ensues.

The interaction among disciplines (...) does not involve simply an exchange of concepts, a sharing of information, a rustle of eager and enquiring conversation; it only takes place within an engagement, and very likely conflict, between cultures. There is always the necessity to engage in interdisciplinary translation, and it is almost inevitable that there will be attempts to establish the dominance of a particular language game. The characteristic of a cultural form, any cultural form, which I want to emphasize is its possession of a distinctive language, with all that that implies in terms of the shared and the different, the familiar and the alien, the domestic and the exotic (...).

The postmodern critique

The view of nature and interactions of contemporary forms of knowledge, which holds most of the attention in philosophic and culture-theoretic discourses, is the post-structuralist and post-modernist one. Briefly, this is that forms of knowledge are submitted to relentless processes of fragmentation to produce an ongoing, confusing but ultimately liberating and empowering diversity of knowledges and opinions – the bringing down of long oppressive forces of centralised authority and meaning (...).

Lytotard has been one of the most articulate of those postmodern writers, largely French, who followed the explorations by the earlier structuralists, such as Lévi-Strauss, Piaget, Lacan, of the idea set out by Saussure that all languages are arbitrary systems of different signs. That is, there is no necessary connection in a language between the sign and the referent (the object in the world to which it refers). The post-structuralist and post-modernist went further and emphasised that the connection between the sign and the signifier (loosely, its meaning), is necessarily unstable and indeterminate, an overlay upon overlay of ambiguity and redundancy (...).

But above all, Lyotard and the post-modernists celebrated the splintering of meaning and the generation of new languages (...). And, importantly for our subject here, the fact that nobody speaks all those languages, that there is (can be?) no universal metalanguage, that there is constant competition (...) in this new era of the search for instabilities and contradictions of meaning (...).
Discourses of knowledge and action

Attractive though in its terms of the liberation of the possibility (…) post-modernism is fatally disabled, in crucial respects, for the enterprise we consider here (…). The social order and any form of social action require agreed norms of meaning and it is action which is our target when we seek to promote greater cooperation among disciplines (…).

Nowhere have the implications for social and political action (…) or reaching practical understandings through processes of communication been more systematically examined than in the work of the contemporary German philosopher and social theorist Jürgen Habermas (…).

Habermas’s theory of communicative action argues that the grounding of the social order and its legitimation in modern, pluralist, post-traditional society is to be sought among the participants (…).

One of his sympathetic but critical commentators (…) Gerard Delanty, [makes] an extended analysis of communicative theory in the context of the cultural and collective identity conflicts of our time, in an epoch in which, in Habermas’s words «the accelerated pace of change in modern societies explodes all stationary forms of life. Culture survive if they draw the strength to transform themselves from criticism and secession» (…).

Delanty (…) argues that universal truth and morality can be articulated in more than one cultural form and more than one logic of development. He attempts to reorient Habermas’s Occidental rationalism to a cosmopolitan model of cultural transformation. Such transformation must proceed in two stages, he argues, of, firstly, reflection and understanding, and, only secondly, of deliberation and agreement. «The aim of reflection is mutual understanding, not consensual agreement (…) Reflective discourse is more concerned with bringing to a heightened level of awareness cultural potentials and (with) recognising difference» (…). This is a thought, which can bear careful consideration when we try here to articulate the conditions for cooperations among different, and often contending, disciplinary cultures (…).

Conclusion

I have extensively promoted the considerable possibilities for systematic interdisciplinary activity in education and other policy contexts, but I confess that my personal experience has caused me to be sharply aware of the difficulties of this sort of cooperation (…).

Like others here I have had an interdisciplinary career (…). At each transition I have had to become sensitive to sharply diverging cultural assumptions, languages, values, practices and power structures. One literally changes, or anyway significantly modifies, one’s identity at each taking up of a new tribal membership (…).
It has been made very clear to me that one of the reasons that I have sometimes been able to talk about, say, economics to engineers, or political theory to the two other disciplines, and receive an interested audience, is that they continue to see me as, at least to some extent, ‘one of them’, to whom a measure of loyalty and trust is due (...).

There most certainly are urgent needs for tolerant cooperation and productive discourses among the great scientific disciplines of contemporary civilization. This is very clear to us when we attempt to deal with the pressing issues which that civilization, and those cultures of knowledge, and let us be sure, of ignorance, have themselves brought upon us. But there is lacking at present a widespread, stable and influential basis for a shared identity of inter-, let alone trans-, disciplinarity. We have to start by expanding our disciplinary communities into more cosmopolitan cultures. It is my argument that we should approach this through the encouragement of mutually respectful processes of both reflection and understanding.
Types of science: mono/multi/inter/trans

Scientists talk of monodisciplinary, multidisciplinary, interdisciplinary and, more recently, transdisciplinary research (…).

The term ‘interdisciplinary’ is often used loosely. It perhaps ought to refer more specifically to research topics and methods that occupy newly-recognised space *between* existing disciplines (or at least entail substantive interaction at the inter-disciplinary boundary). Instead, we often use it synonymously with ‘multidisciplinary’, to refer to collaboration between disciplines working alongside one another (…).

The odd one out of this typology of scientific research is ‘transdisciplinary’. It refers to something more than combinations of, or connection between, disciplines (…).

Maybe some semantic analogy can help us to distil the special meaning of ‘transdisciplinary’? We export and import across a specified boundary; we can deport or report across the same boundary. But when we transport we refer, at least, to a *process* of moving something across an intervening space. Transportation thus entails a new and substantive action or experience. (…) The idea of transportation accommodates this extra notion of an *emergent* experience, an emergent property (…).

The essence of the prefix ‘trans’ is well captured in the distinction between multinational and transnational companies. (…) The former referred to (…) large companies [which] established subsidiaries in many countries, each subsidiary being ‘based’ in the local national economy and being (somewhat) accountable to that jurisdiction. In contrast, transnational companies transcend national boundaries and, increasingly, operate free of national laws and regulations (…).

Such corporations thus acquire a truly global identity, and a style of operating that is not reducible to, nor constrained by, the agendas, structures and processes of the underlying national societies (…).

By analogy, then, *multidisciplinary* science is an assemblage of collaborating disciplines. The whole may or may not be greater than the sum of the parts. In *transdisciplinary* science, the whole is not just greater than its derivative disciplinary parts but it has qualitatively different properties. Further, transdisciplinary science integrates its contributory disciplines such that they are no longer evident as disaggregatable components. Perhaps, then, we are describing a type of science which has emergent properties that are not only different from, but not even necessarily predictable from, its contributory components (…).
Transdisciplinary science (...) is, by definition, a collective enterprise, arising in response to the need to use humankind's knowledge and analytic powers to understand large and complex systems that are not referable to the intellectual framework of any single scientific discipline or set of disciplines (...).

**Transdisciplinarity: a new idea?**

Is transdisciplinarity a new idea in science? There have always been complex, multi-faceted, problems for scientists to think about. However, the classical methods of western science are explicitly reductionist. With this reductionism, we can learn about the complex whole by separate studies of its component parts; we dis-assemble, fractionate, and confine our gaze. Experiments thus typically entail the artifice of holding constant other aspects of an otherwise complex real world. Classical science assumes a lego-like world, reducible to manageably researchable parts. There is no expectation that the whole will behave other than recognisably as the sum of its parts (...).

In a world now beset by an array of large scale environmental and social problems, many scientists are becoming uneasy about the imbalance in science's repertoire of conceptual approaches and research methods. There is a need for approaches that can transcend the limited horizons of existing disciplines and can look to wider horizons — thereby accommodating new dimensions of complexity, scale and uncertainty (...).

There has been recent advocacy and discussion of "post-normal science" and of "soft-systems science". Both of these proffer non-traditional modes of thought, analysis and assessment (...).

Ravetz and Funtowicz have described post normal science as a way of breaking free of reductionist and mechanistic assumption about the way things relate and the way systems operate, (...) and of the traditional expectation that science should deliver final precise estimates unshrouded by uncertainty (...).

The point of the criticism is that some complex systems (...) may not be reducible to model specification (...) and that science should not aspire to uncertainty-free exactitude (...).

Soft system science recognises that, while orthodox science seeks to specify, objectify and quantify, human observers apply differing constructs and perceptions to the "objects" of science. These subjective dimensions are seen as legitimate part of a complex reality being addressed. Soft system science also questions the need for a hierarchical, disaggregatable, external reality. The world is understood to comprise complex systems, typically entailing holarchical relations (and not hierarchical and therefore disaggregatable relations).
Conclusion

Transdisciplinary science is not easy to define. It refers to something more than interdisciplinary and multidisciplinary science. It entails a synergy between contributory disciplines – between their conceptual modes and information sets. This synergy, and the resultant emergent properties of the scientific discourse and conceptualisation, are most likely to occur when a diverse mix of scientists cooperatively tackle research questions that are embedded in large, complex and dynamic systems. Most scientists have made explicit attempts to define approaches to research that free themselves from the tenets and processes of orthodox empirical reductionist science.

Experiences with Transdisciplinarity – Successes

Upon reflection, it is easier to aspire to (and fantasise about) transdisciplinary research than to actually, and knowingly, experience it. Most scientists find it hard enough to break down disciplinary barriers and to even engage in interdisciplinary or multidisciplinary discourse and research. Such contact across boundaries is as much honoured in the breach as in the observance (...).

The task was to get a group of (...) scientists (...) to seek a common understanding, and a convergence of research methods (...). The different groups of scientists should therefore be able to perceive the issues in more generic fashion, and learn from one another (...).

There was a sense that disciplinary identities had partially dissolved, that a common understanding of the problem had emerged, and that we were all grappling with the same issue (...).

These transdisciplinary research experiences are most likely to occur when there are several persons present who have both an eclectic knowledge and a disregard for the boundaries of other people’s intellectual “turf”. There is a need to break down conditioned patterns of deference to experts in other disciplines. Many experts have a wood-versus-trees problem as a result of their confined experience (...).
The first thing that comes to my mind when I hear the term “transdisciplinarity” is problem-centered investigations in contrast to “discipline centered investigations”. Disciplines provide methods of investigation and theoretical frameworks that inform the methods of inquiry. The questions asked are based on what has been accomplished in the past (…).

Transdisciplinarity suggests that one’s queries and investigations are not bound by disciplinary norms (…).

Transdisciplinarity also suggests that some questions are best treated by combining two disciplines or at least their methods of analysis or theoretical frameworks. This type of transdisciplinarity occurs throughout the scientific disciplines and serves as the precursor to newly formed and hybridized disciplines. Fields like psycholinguistic or sociobiology are some examples where two disciplines form a hybrid (…).

The methods or techniques of one discipline help to pose and answer questions generally associated with another (…).

The process of disciplinary mergers can expand the evidentiary base for an established research program in one field. Some people might call this interdisciplinarity, namely the partnerships of two disciplines to expand the theory of evidence in support of certain hypotheses. Recall the partnership of Watson and Crick form the disciplines of biology and physics that resulted in the discovery of the double helix and eventually spawned the new field of molecular biology. That’s how philosophy of science and linguistic philosophy developed (…).

Some people might view the term “transdisciplinarity” as meaning “outside the disciplines”. It would be quite difficult to pose a query that is outside all disciplines. Some discipline would claim the ownership of some part of the query. Likewise it would be difficult to find a method of measurement or of acquiring information or evidence that is outside all disciplines. So if we speak of “transdisciplinarity” as meaning outside of all disciplines (organized fields of knowledge) it imposes too great a burden on the term (…).

The term “transdisciplinarity” has a certain fluidity. It suggests that one is not bound by disciplinary canons in any one field. The term transcendence is appropriate here. There are certain classes of questions that transcend a single discipline. One such class of questions pertain to the synthesis of knowledge. For example, what we can say about human freedom and determinism. This question requires an examination of the recent contributions of many fields of knowledge, including genetics, neurophysiology, physics, behavioral psychology, to name a few (…).

In this context “transdisciplinarity is a type of meta-analysis. It seeks unifying themes from the contributions of diverse disciplines. It involves the construction of a “meta-theory” from many disparate sources of knowledge (…).
Other expressions of “transdisciplinarity” relate to questions that are at the interface of two or more fields. Such questions are not so much outside disciplines but are rather situated within overlapping disciplines (…).

The broad scope of a hypothesis makes it “transdisciplinary” in the sense that the evidence required to dispute it or to support it derives from many different disciplinary sources (…). When such a broad hypothesis is framed that intersects so many disciplines, the problems of confirmation or falsification are complicated (…).

The term “transdisciplinarity” has several meanings to me; the transcendence of disciplines for addressing the meta-questions, the intersection of two or more disciplines for explicating problems, and the combination of methods/techniques/theory from several disciplines in the framing or testing of a hypothesis (…).

One of the most pressing issues of our time are the rising rates of diseases of unknown etiology. In many industrialized nations, breast and prostate cancer fall into this category. Much of the national research efforts directed at discovering the cause of these diseases have followed a reductionist approach (…).

If we are going to make any progress in understanding what, if any, role chemicals play in cancer it will take a major transdisciplinary effort (…). To date, many of these investigations are taking place in parallel. The linkages between the diverse disciplinary studies (…) are poorly developed. The synthetic activity of developing meta-theory across the different studies and disciplinary approaches sees to be at its infancy (…).

Transdisciplinary would require an openness to alternative modes of understanding the disease and better linkages between the reductionist and more holistic paradigms of inquiry (…).

Each of these areas produce insights into a small piece of the problem. A more integrative approach could yield new fruitful and testable hypotheses. This is the essence of transdisciplinarity – looking at the big picture and building a solution to a problem from the disciplinary segments (…).
E.O. Wilson in his provocative essay “Back From Chaos” (...) argues for a fundamental unity that underlies all forms of knowledge (...). He suggests that “the ongoing fragmentation of knowledge and the resulting chaos in philosophy are not reflections for the real world but artifacts of scholarship” (...).

I would argue (and no doubt Wilson would agree) that the ongoing fragmentation has far more than intellectual consequence. If thinking informs our activities in the “real world” (...), the fragmented approach to intellectual life has produced a chaotic and disjointed world (...).

“Transdisciplinarity” is the path back from the chaos; the antidote to fragmentation of knowledge (...). One may quibble about the term – particularly the connotation of “discipline” in an area in which holism should predominate without constraining structures (...). The prefix “trans” in the sense of “transcendence” implies emergence. It is the emergence of integrative knowledge, insights, formed from the segmented domains, that is the essence of transdisciplinarity (...).

It is the tug of war between holism and reductionism that in principle comprises the dynamic of progress in human understanding if only it was a fair game. But the allure, seduction and power of specialization has rendered the match far less than fair. Boundaries, intellectual and otherwise give rise to power and its many abuses. Intellectual boundaries have spurred on their own brand of turf wars (...).

Transdisciplinarity or Integrative Knowledge should not be at the expense of Specialized Knowledge, but rather complement it (...). These are true complements: the value of one without the other may be reduced to zero (...).

The road out of the chaos is to reintegrate knowledge (...). Transcendence is the key to discovery of the fundamental unity that Wilson and many other scholars throughout the ages have referred to (...).

My motivation was simply to use the knowledge I had acquired in one field (economics) to provide a fresh perspective on another (ecology). By serendipity, these explorations provided ecology, eventually, with a body of theory drawn directly from models and concepts that had been widely used in economics for decades (...).

Thus began a transfer across disciplinary boundaries from a field (micro-economics) rich in concepts but poor in experimentation, to a field (ecology) rich in experimentation but theory poor (...).
The models (...) appear to be overly simplistic and invalid (...). This was a case where thinking about a complex behavior was governed by and large by available mathematical techniques – which were capable of yielding precise solutions at the expense of reality (...).

Another shortcoming is the assumption that because one has integrated across several fields, that is a sufficient integration for a complex problem. Often this is not the case (...). Thus arises the question of sufficiency in transcending a few disciplines. The question can only be addressed relative to the problem context (...).

Are the boundaries of the "real world" so large, that the quest for holism breaks down from information overload? I would hope not. Rather the concept of the "holon" put forth by Arthur Koestler, might offer a manageable approach. The holon concept is embedded in a hierarchy of systems, each element in the hierarchy, self contained and sustainable. In this conceptual scheme, one acknowledges the interplay of a host of factors, but focuses on those that are essential to the maintenance of the level of organization which constitutes the problem focus (...).
Definition

Before “transdisciplinarity” entered the English language, the prefix “trans” was already widely used in loan words from Latin. “Trans”, generally speaking, means to move across, beyond or through (...). “Trans” infers something further, greater, more powerful, or more encompassing (...).

The currency of the term “transdisciplinarity” derives from the first international conference on interdisciplinarity hosted by the OECD and held in Nice in 1970. The typology of definitions that emanated from that meeting and a subsequent book distinguished “interdisciplinarity” interaction of two or more disciplines from a more comprehensive and systematic integration: «Transdisciplinarity... Establishing a common system of axioms for a set of disciplines» (...).

A decade later, (...) Raymond Miller (...) defined transdisciplinary approaches as holistic conceptual frameworks that transcend the narrow scope of disciplinary worldviews. Through an overarching synthesis, these frameworks metaphorically encompass parts of the material fields that disciplines usually handle separately (...).

Some proponents believe their conceptual frameworks should replace existing disciplinary approaches. Others put them forward as alternatives or as providers of coherence when working across disciplines. Proponents also claim different degrees of isomorphism between their schemes and the “real world” they purportedly represent. In addition, the status of quantitative explanation and manipulation differs from framework to framework (...).

Knowledge Fields

When used as a description of knowledge fields, the word “transdisciplinary” refers, most often, to a synoptic breadth of vision or application (...).

Any transdisciplinary effort is implicitly a critique of the existing structure of knowledge, education, or culture (...). Depending on the particular scheme, disciplines are reconfigured as subordinate, instrumental or irrelevant (...); there is a deliberate effort to transform, not just transcend, disciplines (...).

Broadening Networks

Clearly, transdisciplinarity means more than one thing. It is perceived as a vision of knowledge, a particular theory or concept, a particular method, and an essential strategy for addressing complex problems of the contemporary world (...).
Knowledge Studies

Two major lessons emerge from knowledge studies. The first is that while some transdisciplinary efforts have had greater impacts than others, even successful frameworks encounter limits. General systems theory, for example, has enjoyed wide influence as a theoretical framework, a conceptual approach in a wide variety of particular fields, and a method of engineering practice. Despite its wide influence, though, the broad unifying capacity of general systems tends to be splintered in day-to-day practice (…).

The second lesson is implied in the first. Transdisciplinary schemes have holistic promise, but they have also succumbed to reductionism (…).

The ideological problem of transdisciplinarity is laid bare in the problem of holism. Any metaphor, theme, theory, or conceptual scheme (…) implies a totality that cannot be adequately explained by reduction to the properties of its parts. Campaigns for unified knowledge, transdisciplinary schemes, and holistic thought promote a metaphysical model that is an interrelated conception of the world. Ironically, though, holisms have proved contradictory both within and among themselves (…).

Working Examples

Beyond knowledge studies, I have also participated in the work of two centers, the Worldviews project and the Centre International de Recherches et Etudes Transdisciplinaires, CIRET (…).

The Worldviews project (…) supported research projects aimed at integrating knowledge (…), research on bridging language and mathematics, the natural and social sciences, and the arts, sciences, and philosophies (…).

The [CIRET], headquartered in Paris, is a smaller Transdisciplinary project informed by the new worldview of complexity furnished by modern science. It aims at creating connections in all areas of study, including religious studies, education, science, culture, and the arts (…).

The [CIRET] does not seek to create a new discipline or a new kind of specialist. It aims, instead, to create a common “workspace” for transdisciplinary research across all levels of education and a “locus” for gathering a self-organizing group of teachers and students who are “animated by transdisciplinary attitude” (…).

Transdisciplinarity in the service of pressing societal issues

Many pressing societal issues call for transdisciplinary research, problem-solving, and education. Health care is a particularly compelling example that illustrates the multiple levels across which transdisciplinarity must operate. Transdisciplinarity is both an organizational problem and an epistemological problem (…).

In the fields of child development and problems of the handicapped, a “transdisciplinary” approach connotes more systematic delivery of health care than
occurs in a “multidisciplinary” juxtaposition of specialists or “interdisciplinary” coordination of their expertise (...).

A “transdisciplinary” team participates in more thorough assimilation of knowledge. [The team’s members] work together, rather than in a sequential separation, to assimilate their knowledge and perspectives (...).

Because institutional arrangements differ, understandings of interdisciplinarity differ. In daily work, the various meanings and arrangements have to be continually reconstituted through informal negotiations. Work beyond single disciplines, moreover, is always a “situated endeavor”. Broad knowledge is necessary, but it must be contextualized in the local dynamics of practice (...).

The epistemological problem of transdisciplinarity centers on the discrepancy between a discipline-based concept of disease and what is often called a biosocial or biopsychosocial model (...).

A transdisciplinary model operates across, as it encompasses, [many] levels. The human being is perceived to be an interacting, integrated whole (...).

[The] analysis of the medical curriculum underscores the difference between instrumental bridges of specialist knowledges and a more transdisciplinary, critically grounded conceptualization of the medical sciences (...). Any valid therapeutics must be based in a holistic view of the patient (...).

When interdisciplinarity is conceived as a short-term solution to problems, as it has been in many research centers focused on social and economic problems, questions of transdisciplinary epistemology are replaced by the pragmatics of reliability, efficiency, and commercial value. An epistemologically creative and critical stance towards disciplinarity and professionalism holds out the promise of a more comprehensive map of knowledge (...).

Optional Insights

Michael Gibbons et al. put forward a new theory of transdisciplinarity. In «The New Production of Knowledge» they contend that the dynamics of science and research in contemporary societies have changed. [Beside] the traditional form of knowledge production [there is a new one] characterized by closer interaction among scientific, technological, and industrial modes of knowledge production. As such, it is nonhierarchical, transdisciplinary, and characterized by heterogeneously organized forms (...).

[It] has several consequences that are relevant to any transdisciplinary project. Human resources are more mobile, and the organization of research is more open and flexible. Sites of knowledge production have also increased in number and in kind (...). Collapse of monopoly power accompanies diversification. As the organizational boundaries of control blur, the underlying notion of competence is redefined. Resources, knowledge, and skills are being ceaselessly reconfigured (...). Sites of knowledge production and their networks of communication move on, creating a web that reaches across the globe in growing density and connectivity (...).
The task of transdisciplinarity is to create meaningful webs of meaning across forms of knowledge and action that are characterized by complexity, diffusion, permeation, and heterogeneity. Toward our common task of figuring out which transdisciplinary web we might spin collectively, I offer several discussion points that comprise imperative for action:

The Information Imperative: While there is always more to learn, we already know a great deal about how to integrate knowledge. This information, however, is not always brought to bear on projects. Wider dissemination and use of existing knowledge is a crucial outcome for any transdisciplinary project.

The Disciplinary Imperative: In the past, disciplines have been dominated by what has been called the “received dogma” of preparing students first in clearly-defined disciplines. The dogma is blurring today. Complexity and interdisciplinarity are key factors. Transdisciplinary efforts need to forged in the two-way traffic of Sommerville and Rapport’s concepts of “intellectual outerspace” and “innerspace” of disciplines. They comprise the spatial dynamics of transdisciplinarity.

The Electronic Imperative: Emerging from the first two imperatives, there is a glaring need for a transdisciplinary electronic communication network. A global network would enhance local projects by informing them with a broader and more connective picture. A powerful website with hot links to a wide range of projects and a robust discussion list would go a long way toward greater cooperation among now separated projects, more extensive use of existing knowledge and information, and more focused new projects.
Approaches to transdisciplinarity

The histories of the notions of “discipline” are also the histories of technologies and forms of domination. Long before M. Foucault, for example, made us well aware that the notion signifies *regimes of power relations* the complex relationship between discipline, power and knowledge stood encapsulated in the ancient Sanskrit word: *shiksha* which signifies both *learning* [education] and *penalty* (...).

Traditions of knowledge have shown, all too often, that the Other of discipline has the potential of causing paradigm shifts. These traditions have also shown the resilience of dominant traditions, which tame and domesticate the dissenting academy into yet another kind of flourishing enterprise. The profound interrogation of ways of knowing of yesterday become the *doxa* of today (...).

Notions of *reason* and *rationality* lie congealed in the notions about transdisciplinarity. These perform versatile functions. Among these are:

a. banishment and exile of non-, pre-, anti- rational knowledge (...),

b. erection of barriers between *reason* and *emotion* (...) and *reason* and *vision* (...).

c. drawing of distinctions between *hard* and *soft* knowledges,

d. privileging forms of knowledge into named genres and bodies of knowing and knowledge (...).

Multi-, inter- and even trans- disciplinarity must bear its birthmarks. All these indicate an active desire to go beyond one’s ‘discipline’. (...) This desire signifies a discipline’s extraversion. One may extend one’s disciplinary burdens but almost never forsake the disciplinary identity, persona and tradition. For, Reason demands integrity of epistemic selfhood, continuity with prescribed ways of privileged ignorance and willful immersion in objects of knowledge (...).

Should the world exist, canons of interpretation and formation of epistemic communities require knowledges to be fragmented, and therefore specialized, for it to be understood and mastered. The very notion of civilization since the Age of Enlightenment is that knowledge is power as Joseph Kohler, a late nineteenth century jurist defined it, civilization is a twofold process of mastering: of the self (...) and the world (...).

If transdisciplinarity constitutes an epistemic break from the worlds of inter- and multi- disciplinarities, too many reversals will have to ensue. Among these reversals surely are:

a. Equal respect for the non-Western traditions of knowledge (we, most of us in the South, do know the traditions from Descartes to Derida, but please find a
reference, even at random, to Buddha, Nagarjuna, Samkara, Kuatilya, Barthirahri or even Gandhi in the contemporary European corpus);
b. Equal discursive dignity for 'organic' knowledges: knowledges uncodified as esoteric knowledges (...);
c. Equal discursive dignity to the traditions of knowing in pre-colonial cultures, especially traditions of knowing as women;
d. Equal discursive dignity to the indigenous jural and juristic traditions (even Habermas, writing at the turn of the century marked by ‘information explosion’ shows no conception of anything remotely non-European in terms of traditions of thought and praxis concerning rights and justice in the different worlds).

Trans-disciplinarity to my mind, has yet to be fully de-colonialized.

**Learning from transdisciplinarity**

For me, transdisciplinarity consists in a dialog between the epistemic communities of erudite knowledges and practitioners of organic knowledges. This becomes possible only if equal discursive dignity is accorded to both types of knowledges.

**Failures**

The limits of multi-disciplinarity are the all too often shaped by the relationship between knowledges and material interests they serve. This was manifested in my fifteen year long engagement with the 200,000 (...) victims of Bhopal catastrophe (...). Corporate science was not, following classical models of causality, able to extrapolate with any degree of certitude the impact of this massive release [of 47 tons of methylisocyanate gas] on human beings (...). Epistemic *humility* in face of mass disaster caused by hazardous science and technology is matched only by imperial arrogance in ameliorating potentials for the wretched of the earth. *Causal agnosticism reigns supreme in the very moment of catastrophe.*

These carefully choreographed rhythms (confidence in modern science and technology and the cultivated inability to relate catastrophes to causes) summates what Ulrich Beck has described as the creation of the *global risk society,* marked by the registers of *organized irresponsibility* and *organized impunity* of capital intensive corporate science and technology.

These registers also modulate the *social technology of law and rights.* With all its impregnation by the imaginative enunciation of human rights rhetoric, modern law assumes the figure and feature of a bystander. Not merely does it mutely witness the annihilation of the rights-regimes by risk-regimes. It also pervasively *disarticulates* victims of mass disaster.

Transdisciplinarity arrives at the moment of crisis in the discourse of human rights accountability of the foremost practitioners of science and aggregations of global capital and technology.
Some considerations about transdisciplinarity: a new metaphysics?

The development of disciplinary structures of thinking within universities in the nineteenth century (...) produced both “blindness and insight”. Insight, certainly, by encouraging a deeper knowledge of increasingly specific subject matters. But blindness likewise, since this specificity was achieved at the expense of a broadness of vision. There was an increase of expertise but a loss of imagination (...). It is now apparent that in the many areas the marginal rate of return on increased insights has long since been outweighed by the marginal cost of blindness (...).

Within particular disciplines, specialisation has become an institutional rather than an intellectual demand. Increasingly it is issues like professional legitimacy, funding models, and career advancement, which drive the pressure towards ever greater expertise over ever smaller areas (...).

The intellect of human beings is not naturally confined: we draw connections, we are curious, we seek truths in many spheres. We use all our life to understand our life. The compartmentalisation of thinking (...) fails to capture either how human beings relate to the world, or what excites them. To make a bold claim: it is not a lack of intellectual power, which inhibits us from solving problems; it is boredom and disinterest (...).

Interdisciplinarity attempts to combine more than one disciplinary framework, but without in any way attempting to redraw those boundaries. On the contrary, such an approach insists on the need to maintain the methodology of a discipline even while bringing one to bear on another. It asks scholars to apply what they know about one discipline to the subject matter of another, so that for example “the sociology of law” is an interdisciplinary study of law (as a discipline with its own epistemology and history) applying sociological methods and asking sociological questions. This is often a most valuable exercise, but note that far from undermining the disciplinary paradigm, it entrenches it. One juxtaposes A to B as two distinct bodies of knowledge (...).

Transdisciplinarity creates new objects of study by examining the themes or aspects which different disciplines have in common and therefore assume without interrogation. Transdisciplinarity is to disciplines as metaphysics is to physics; transdisciplinarity is to disciplines as factors are to numbers. One therefore extracts new themes or issues to pursue and examines their operation or treatment across rather than between disciplines. In this sense, Focault is the intellectual paradigm of transdisciplinary studies: in works such as The Archaeology of knowledge, he searches for the revealing commonalities between such widely disparate disciplines as economics, linguistics, and biology, finding in their approaches similar patterns of analysis and change (...).
The disciplines therefore are in one sense the way of accessing a new theme of study; but in another sense, their treatment or ignorance of that theme is itself the issue. Transdisciplinarity takes disciplines as objects of study in a way in which interdisciplinarity cannot.

Transdisciplinarity examines a particular site or sites of interest without a particular disciplinary strategy in mind. It is the site as observed and not the intellectual tradition of the observer which determines the approach (...).

Areas such as the 'city', or 'drugs', provide places of conjunction between such a variety of disciplinary issues that no disciplinary or interdisciplinary framework can do it justice. It is only by treating every discipline as relevant but never a hegemonic structure that an understanding of the meaning of that site can really be developed (...).

Transdisciplinarity treats different disciplines as verbs rather than nouns.

The treatment of disciplines – the use of the word "and" – as implying a mutual constitution of subjects rather than a conjunction of objects, is what marks out the territory of the transdisciplinarity.

Change comes from thought, and thought comes from the imagination (...). Brain is a web of connections developed, entrenched, and enriched over a lifetime of experience. By multiplying the ways in which ideas are expressed, we multiply the web of connections in our thinking, and therefore multiply both our ability to communicate and the ability of the listener to build on those ideas out of their own experiences and knowledges (...).

There is something enormously revealing about the very connections which a society has chosen not to focus on. The sideways glimpse, the unspoken assumption, tells one an enormous amount about the nature and the structure of a society or an issue. By focusing on the kind of connections which have not been considered before (...) one finds a great deal of surprising material.

Transdisciplinarity is the meeting point of people and mind.

It is precisely by applying a variety of different perspectives to a particular site or issue, and through critiquing the approach taken by traditional disciplines in relation to that site, that one is engaged in transdisciplinary work. Further, the capacity of transdisciplinary studies to multiply our ways of knowing, and to connect reason to emotion, ethics to politics, and knowledge to aesthetics, makes it both productive of new ways of thinking about entrenched social problems, and communicative to a broad range of social stakeholders. The pedagogic appeal and the intellectual innovation offered by transdisciplinary work is particularly important in addressing otherwise intractable social issues.

The transdisciplinary work (...) emphasised that understanding comes not just from words but from images (...). These emphasise that there is something intellectual beyond words, something to be understood which cannot be captured by traditional
disciplinary methodologies, and through which we can begin to see that a way of seeing or an aesthetic, and a way of thinking or an epistemology, are in fact mutually constitutive (...). By bringing together such a range of approaches, and using such a resolutely interactive and imaginative process, I believe that transdisciplinary studies offers a way forward, which established disciplines, cannot provide (...).

It is only by multiplying insights in relation to a specific site of interaction (...), and focusing on the themes which emerge in common out of a number of different disciplines, that we can begin to appreciate why [a] problem seems so difficult to resolve (...).

The ideas of: site specific analyses; disciplines as engaged in the mutual constitution of and not merely the objective consideration of the problem; the search for buried and shared themes amongst disciplines; a focus in particular on discourse and semiotics as the way in which meaning in a culture is not just imparted but actively circulated, shared, communicated, and changed along the way; all suggest that it is only by trascending disciplines that we can begin to understand these problems, and then begin to communicate our understanding to a wider community.
Existing models of cross-disciplinary cooperation are often biased towards hierarchical organization (...). Here, a single (usually natural scientific) discipline is enthroned as key discipline while others are instrumentalized as auxiliary disciplines for certain well-defined questions. This model hardly seems suitable for the study of the multi-layered complexity of sustainability issues (...).

In order to structure the debate about cross-disciplinary cooperation, the following section distinguishes three basic models. All of them are appropriate for cross-disciplinary research (...). However, different implications emerge from these models of cooperation (...).

The first model can be referred to as “goal-oriented multi-disciplinarity”. This type of research examines the possibilities of achieving a given objective, for instance a reduction in car exhaust fumes, with the help of various disciplines. Generally speaking, the objectives here are specified and fixed in advance by policy makers; the individual disciplines can adhere almost entirely to their traditional methods, theories, and approaches. Within the framework of such research there is only a small impetus towards interaction between disciplines. A “synthesis”, if undertaken at all, only refers to the level of results. It is usually done via the policy makers, as clients, and often involves only a mere adding together of results from the different disciplines. To stick with the traffic example: taking the technical options as the point of departure, economic, legal, and possibly behavior-oriented measures are put forward without explicit consideration of the interaction of such options and their perhaps contradictory effects.

(... One of the major limitations of this model lies in the fact that, whether implicitly or explicitly, it works with certain notions of the importance and ranking of the various disciplines: economics is usually assumed to be more important than psychology, technology more important than politics, etc. (...).

A second form of cross-disciplinary cooperation can be addressed in terms of “problem-oriented interdisciplinarity”. Here too, socially relevant problems or solutions are at the center of proceedings; the definition of problems, however, is tied more closely to a process of negotiation between non-scientific actors and the scientists involved. In this way, the different disciplines agree, at least roughly, on a common description of the problems under review, they then proceed to process certain aspects of the whole problem on a relatively independent basis and, for the most part, using their customary disciplinary theories and methods. The result, however, are viewed in the context of results from other disciplines, thus becoming subject to relativization and modification. Thus an interdisciplinary exchange takes place, albeit on the level of findings rather than that of theories and methods. The
concept of sustainability provides in this case a general framework for the definition of socio-ecological problems and a line for their transformation into scientific questions. This model can prove effective for many issues; indeed, it does offer a greater scope for dealing with sustainability issues since it makes partial allowance for their complex and multi-dimensional character. And yet this model does not produce enough in the way of impulses and stimuli for self-reflexive changes to the disciplines, and for a review of the range of their theories and methods with regard to the problems raised by sustainability.

Finally, "self-reflexive transdisciplinarity" offers a third model of cross-disciplinary cooperation. It begins with explicitly recognizing that the issues of sustainability extend beyond the traditional subject matter of the respective disciplines and, as such, constitute a "transdisciplinary field" (...). As a consequence of this acknowledgement, the conceptual and methodological limitations, which are tied to each disciplinary perspective, are critically examined in the light of these issues. Thus, in contrast to the establishment of environmental oriented sub-disciplines at the margins of existing disciplines, self-reflexive transdisciplinarity promotes theoretical, conceptual and methodological reorientations with respect to core concepts of the various social sciences disciplines (...).

However it is important to emphasize that the processing of sustainability issues within this transdisciplinary field requires not only self-reflexive shifts within the various disciplines, but also the improvement of cross-disciplinary cooperation by an integrative conceptual framework and organizational structures for cooperation. The role of such a theoretical framework consists mainly of offering a flexible, analytic model for the cooperation. This role should not be underestimated since there is evidence that even multi- or interdisciplinary cooperation is likely to fail in the absence of an integrating conceptual framework (...). Nevertheless, the reference to a theoretical framework is not intended as a rigid and highly general meta-theory, but rather as a flexible, problem-oriented framework concept, that itself has to be open to self-reflection to the highest degree.

It should be emphasized that in this context "theoretical framework" does not mean "unifying" framework. Thus, the conflict between a unifying framework and the plurality of theoretical and methodological approaches need not necessarily arise. On the contrary, a theoretical framework can even promote and strengthen methodological pluralism, by structuring a wide range of new questions and suggesting and stimulating new methodological and theoretical access (...).
Bibliography on Transdisciplinarity
PART I: PUBLICATIONS FROM PREVIOUS CONFERENCES
ADDRESSING TRANS- AND INTER-DISCIPLINARY ISSUES
PERTINENT TO ROYAUMONT MEETING

OECD-Sponsored Conferences


UNESCO-Sponsored Conferences


Proceedings of World Congress of Transdisciplinarity of the Centre International de Recherches et Etudes Transdisciplinaires (CIRET). Proceedings from 1994 meeting in Portugal forthcoming from Hugin Editores Ida (Lisbon). Hard copy available also in Rencontres Transdisciplinaires: Bulletin Interactif du CIRET. For electronic versions and forthcoming bibliography of transdisciplinary literature, see CIRET Website (http://perso.club-/internet.fr/nicol/ciret/)

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PART II: PUBLISHED REPORTS

Reports Based on Institution-Wide Studies, Symposia, & Workshops

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PART III: ADDITIONAL REFERENCES OF INTEREST TO ROYAUIMONT PARTICIPANTS


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PART IV: BOOKS


PART V: PAPERS


Note Transdisciplinarity is a new concept. Therefore as of today it is extremely difficult to encounter titles on this issue. An alternative way to explore the production worldwide is to proceed with caution and to refer to the notion of Interdisciplinarity. Parts I to III of this bibliography were prepared by Prof. Julie Thompson Klein for the Symposium in Royaumont. Parts IV and V are based on the one compiled by Dr. Bruce Janz, Assistant Professor of Philosophy, Augustana University College, for the use of the Centre for Interdisciplinary Research in the Liberal Arts (CIRLA). Out of the hundreds of books on particular interdisciplinary research programs, or on combinations of particular disciplines, this bibliography focuses on works that reflect on the meta-question of doing interdisciplinary research or teaching.
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